

2505

No. 1

**United States Circuit Court of Appeals
for the Ninth Circuit**

HASSAM PAVING COMPANY AND OREGON HASSAM
PAVING COMPANY,

Appellees,

vs.

CONSOLIDATED CONTRACT COMPANY AND PACIFIC COAST
CASUALTY COMPANY,

Appellants.

Transcript of Record (Two Volumes)

Vol. I

(pp. 1 to 345 and index to Vol I)

UPON APPEAL FROM THE UNITED STATES
DISTRICT COURT OF OREGON

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JESSE STEARNS,
JOHN H. HALL,

Solicitors and Counsel for Appellants.

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District Court of the United States,

DISTRICT OF OREGON,

(In Equity).

HASSAM PAVING COMPANY, a corporation and OREGON HASSAM PAVING COMPANY, a corporation,

Complainants,

vs.

CONSOLIDATED CONTRACT COMPANY, a corporation and PACIFIC COAST CASUALTY COMPANY, a corporation,

Defendants.

STIPULATION.

It is hereby stipulated and agreed by and between the parties hereto that the amended bill of complaint hereto attached may be filed by the complainants in the above-entitled suit and that the defendants may have to and including the first Monday in May, 1912, in which to answer the same.

Dated, April 11, 1912.

CAREY & KERR,

Attorneys for Complainants.

HALL & STEARNS,

Attorneys for Defendants.

DISTRICT COURT OF THE UNITED STATES,
 DISTRICT OF OREGON,
 (In Equity).

HASSAM PAVING COMPANY, a corporation and OREGON HASSAM PAVING COMPANY, a corporation,

Complainants,

vs.

CONSOLIDATED CONTRACT COMPANY, a corporation and PACIFIC COAST CASUALTY COMPANY, a corporation,

Defendants.

AMENDED
 BILL OF
 COMPLAINT.

TO THE JUDGES OF THE DISTRICT COURT OF THE
 UNITED STATES FOR THE DISTRICT OF OREGON:

HASSAM PAVING COMPANY, a corporation duly created and existing under the laws of the Commonwealth of Massachusetts and having its principal place of business in the City of Worcester, County of Worcester, in said Commonwealth, a citizen of the State of Massachusetts; and OREGON HASSAM PAVING COMPANY, a corporation duly created and existing under the laws of the State of Oregon and having its principal place of business in the City of Portland, County of Multnomah, in said State, a citizen of the

State of Oregon, by leave of court brings this their amended bill of complaint against CONSOLIDATED CONTRACT COMPANY, a corporation organized and existing under the laws of the State of Oregon, a citizen of the State of Oregon and a resident and inhabitant of the City of Portland, County of Multnomah, in said State of Oregon; and PACIFIC COAST CASUALTY COMPANY, a corporation organized and existing under the laws of the State of California, having its principal office in the City of San Francisco in the said State, and a citizen of California and a resident and inhabitant of the State of California.

And thereupon your orators complain and say:

I.

That the Hassam Paving Company at all the times hereinafter mentioned was and still is a corporation duly created and existing under the laws of the State of Massachusetts, and having its principal place of business in the City of Worcester, County of Worcester, in said Commonwealth; that at all said times your orator, the Oregon Hassam Paving Company, was and still is a corporation duly created and existing under the laws of the State of Oregon and having its principal place of business in the City of Portland, County of Multnomah, in said State; that the defendant Consolidated Contract Company at all said times was and still is a corporation duly created and existing under the laws of the State of Oregon and a resident of the said State; and the defendant Pacific Coast Casualty Company was at all of said times and

still is a corporation duly created and existing under the laws of the State of California and a resident of the State of California but having an office and engaged in business within the State of Oregon.

II

That heretofore, to-wit, prior to the 7th day of June, 1905, one Walter E. Hassam, being then a citizen of the United States, residing at the said City of Worcester, in the County of Worcester, in the State of Massachusetts, was the sole, original and first inventor of a certain new and useful invention entitled "Pavement and Process of Laying the Same," a more particular description of which will be found in the letters patent issued therefor by the Government of the United States, hereinafter referred to, and to which special reference is hereby made.

III

That the said Pavement and Process of Laying the Same was a new and useful invention which was neither known nor used by others in this country before the invention and discovery thereof by the said Hassam, and which was never patented nor described in any printed publication in this, or any foreign country before the invention and discovery thereof by the said Hassam, or more than two years before his application for United States Letters Patent therefor, and at the time of his application for United States letters patent therefor, as hereinafter alleged, the same had not been in public use or on sale in the

United States for more than two years, and was not patented or caused to be patented by him, or by his legal representatives or assigns, in any foreign country upon an application which was filed more than twelve months prior to the filing of his said application in this country, nor had the same been abandoned by him.

IV

And your orators further show unto your Honors that the said Hassam, being as aforesaid, the original and first inventor of said Paving and Process of Laying the Same, did on the said 7th day of June, 1905, duly and regularly file in the patent office of the United States an application in writing praying for the granting and issuance to him of letters patent of the United States for the same; that prior to the granting and issuing of any patent therefor, the said Hassam, for value received, did, by an instrument in writing under his hand and seal, duly witnessed and executed, sell, assign and transfer unto one Charles K. Pevey of Worcester, County of Worcester, State of Massachusetts, an undivided one-half interest in and to the said invention, and in and by said assignment, did request the Commissioner of Patents to issue such patent as might be granted upon such application, to the said Walter E. Hassam and Charles K. Pevey, jointly, which assignment in writing was filed and recorded in the patent office of the United States prior to the granting and issuance of any patent for said invention; and your orators pray that the said instrument in writing may be deemed and

taken as part of this bill, and to the original or to a duly authenticated copy thereof now in your orators' possession and in court to be produced, your orators pray leave to refer.

V

And your orators further show unto your Honors that after proceedings duly and regularly had and taken in the matter of said application, to-wit, on May 1, 1906, letters patent of the United States bearing date on that day and numbered 819,652, were granted, issued and delivered by the Government of the United States to said Walter E. Hassam and Charles K. Pevey, jointly, whereby there was granted to them, their heirs or assigns, for the term of seventeen years from the first day of May, 1906, the sole and exclusive right, liberty and privilege, to make, use, and vend the said invention throughout the United States of America and the territories thereof.

VI

And your orators further show unto your Honors that said letters patent of the United States were issued in due form of law in the name of the United States under the seal of the Patent Office of the United States, signed by the Commissioner of Patents of the United States, and prior to the issuance thereof all proceedings were had and taken which were required by law to be had and taken prior to the issuance of letters patent for new and useful inventions; and said letters patent, or a duly authenticated copy thereof are ready in court to be produced by your orators,

and which are hereby referred to, and by such reference made a part hereof.

VII.

And your orators further show unto your Honors that before the infringement hereinafter complained of, said Walter E. Hassam and said Charles K. Pevey, by an instrument in writing, duly signed, sealed and delivered by them, and recorded in the United States Patent Office, did sell, assign and transfer to your orator, the Hassam Paving Company, all the right, title and interest in and to said invention and in and to said letters patent numbered 819,652, obtained thereon, together with all claims, demands and causes of action for the past infringement of the said letters patent wheresoever or by whomsoever committed; and ever since the execution and delivery of said assignment your orator, the Hassam Paving Company, has been, and still is the sole and exclusive owner of said letters patent.

VIII

That heretofore, to-wit, prior to the 30th day of November, 1906, the said Walter E. Hassam was the sole, original and first inventor of a certain new and useful invention entitled, "Artificial Structure and Process of Making the Same," a more particular description of which will be found in the letters patent issued therefor by the Government of the United States and hereinafter referred to and to which special reference is hereby made.

IX

That the said Artificial Structure and Process of Making the Same was a new and useful invention which was neither known nor used by others in this country before the invention and discovery thereof by the said Hassam, and which was neither patented nor described in any printed publication in this or any foreign country before the invention and discovery thereof by the said Hassam, or more than two years before his application for United States letters patent therefor, and at the time of his application for United States letters patent therefor, as hereinafter alleged, the same had not been in public use or on sale in the United States for more than two years, and was not patented or caused to be patented by him, or by his legal representatives or assigns in any foreign country upon an application which was filed more than twelve months prior to the filing of his said application in this country, nor had the same been abandoned by him.

X

And your orators further show unto your Honors that the said Hassam being, as aforesaid, the original and first inventor of said Artificial Structure and Process of Making the Same, did on the said 30th day of November, 1906, duly and regularly file in the Patent Office of the United States an application in writing praying for the granting and issuance to him of letters patent of the United States for the same; that prior to the granting and issuing of any patent

therefor, the said Hassam, for value received, did, by an instrument in writing under his hand and seal, duly witnessed and executed, sell, assign and transfer unto your orator, the Hassam Paving Company, all the right, title and interest in and to said invention, and in and by said assignment did request the Commissioner of Patents to issue such patents as might be granted upon said application to your orator, the Hassam Paving Company, which assignment in writing was filed and recorded in the Patent Office of the United States prior to the granting and issuance of any patent for said invention; and your orators pray that said instrument in writing may be deemed and taken as a part of this bill, and to the original or to a duly authenticated copy thereof now in your orators' possession, and in court to be produced, your orators pray leave to refer.

XI.

And your orators further show unto your Honors that after proceedings duly and regularly had and taken in the matter of said application, to-wit, on the 30th day of July, 1907, letters patent of the United States bearing date on that day and numbered 861,650 were granted, issued and delivered by the Government of the United States to your orator, the Hassam Paving Company, whereby there was granted to your orator, the Hassam Paving Company, its legal representatives or assigns for the term of seventeen years from the said 30th day of July, 1907, the sole exclusive right, liberty and privilege, to make, use and vend

the said invention throughout the United States of America and the territories thereof; that ever since the issuance of said letters patent your orator, the Hassam Paving Company, has been and still is the sole and exclusive owner of said letters patent.

XII.

And your orators further show unto your Honors that said letters patent of the United States were issued in due form of law in the name of the United States under the seal of the Patent Office of the United States, signed by the Commissioner of Patents of the United States, and prior to the issuance thereof all proceedings were had and taken which were required by law to be had and taken prior to the issuance of letters patent for new and useful inventions, and said letters patent are ready in court to be produced by your orators, or a duly authenticated copy thereof, and which are hereby referred to and by such reference made a part hereof.

XIII.

And your orators further show unto your Honors that heretofore, to-wit, prior to the 14th day of November, 1906, the said Walter E. Hassam was the sole, original and first inventor of a certain new and useful invention entitled "Process for Laying Pavement", a more particular description of which will be found in the letters patent issued therefor by the Government of the United States, and hereinafter re-

ferred to, and to which special reference is hereby made.

XIV.

That the said Process for Laying Pavement was a new and useful invention which was neither known, nor used by others in this country before the invention and discovery thereof by the said Hassam and which was neither patented nor described in any printed publication in this, or any foreign country, before the invention and discovery thereof by the said Hassam, or more than two years before his application for United States letters patent therefor, and at the time of his application for United States letters patent therefor, as hereinafter alleged, the same had not been in public use or on sale in the United States for more than two years, and was not patented nor caused to be patented by him, or by his legal representative or assigns in any foreign country upon any application which was filed more than twelve months prior to the filing of his said application in this country, nor had the same been abandoned by him.

XV.

And your orators further show unto your Honors that the said Hassam, being as aforesaid, the original and first inventor of said Process for laying Pavement did on the said 14th day of November, 1906, duly and regularly file in the Patent Office of the United States an application in writing praying for the granting and issuance to him of letters patent of the United States

for the same; that prior to the granting and issuing of any patent therefor, the said Hassam for value received, did by an instrument in writing under his hand and seal, duly witnessed and executed, sell, assign and transfer to your orator, the Hassam Paving Company, all the right, title and interest in and to said invention, and in and by said assignment did request the Commissioner of Patents to issue such patent as might be granted upon said application, to your orator, the Hassam Paving Company, which assignment in writing was filed and recorded in the Patent Office of the United States prior to the granting and issuance of any patent for said invention; and your orators pray that said instrument in writing may be deemed and taken as a part of this bill and to the original or to a duly authenticated copy thereof, now in your orators' possession and in court to be produced, your orators pray leave to refer.

XVI.

And your orators further show unto your Honors that after proceedings duly and regularly had and taken in the matter of said application, to-wit, on April 23rd, 1907, letters patent of the United States bearing date on that day and numbered 851,625 were granted, issued and delivered by the government of the United States to your orator, the Hassam Paving Company, whereby there was granted to it, its assigns or legal representatives, for the term of seventeen years from said 23rd day of April, 1907, the sole and exclusive right, liberty and privilege to make, use and vend said

invention throughout the United States of America and the territories thereof, and ever since the issuance of said letters patent, as aforesaid, your orator, the Hassam Paving Company, has been and still is the sole and exclusive owner and holder of said letters patent.

XVII.

And your orators further show unto your Honors that said letters patent of the United States were issued in due form of law in the name of the United States, under the seal of the Patent Office of the United States, signed by the Commissioner of Patents of the United States, and prior to the issuance thereof, all proceedings were had and taken which were required by law to be had and taken prior to the issuance of letters patent for new and useful inventions, and said letters patent are ready in court to be produced by your orators, or a duly authenticated copy thereof, and which are hereby referred to, and by such reference made a part hereof.

XVIII.

And your orators further aver that all of said inventions described in and claimed by the said three letters patent number 819,652, number 861,650 and number 851,625 are capable of embodiment and conjoint use in one and the same structure and have been so embodied and conjointly used by them, and will be so embodied and conjointly used by the defendant Consolidated Contract Company in its threatened infringement hereinafter complained of.

XIX.

Your orators further say that the Hassam Paving Company was organized particularly to exploit and develop said inventions, that it made a large investment for this purpose, and that it and its licensees have made and constructed large amounts of pavements which in construction and mode of operation embody the invention and discovery described and claimed in said three letters patent numbers 819,652, 861,650 and 851,625; that said inventions or discoveries have been recognized throughout the United States as a higher order of excellence and the pavement constructed thereunder has been adopted as the standard by many municipalities and highway commissions; that the rights covered by said three several patents have been acquiesced in generally by the public throughout the United States, with the exception of these defendants, and that the exclusive right to control the same has been and still is of great benefit and advantage to your orators and is the basis of a large and substantial business.

XX.

And your orators further say that your orator, the Hassam Paving Company, on or about the 16th day of July, A. D. 1909, gave and conveyed unto your orator, the Oregon Hassam Paving Company, the exclusive right to use and make said improvements in Pavements and Foundations, and Processes of Laying the Same, according to the said three several letters patent and each of them above recited, for and during

the term beginning the 16th day of July, A. D. 1909, and ending with the expiration of the term of said letters patent in the State of Oregon and a strip in the Southern part of the State of Washington extending from the westerly line of said State, easterly to the Columbia River, and being twenty-five (25) miles in width, measured from the southern boundary of the State of Washington, north, but not elsewhere or in any other place, upon the payment of certain license fees or royalties and certain conditions contained in said license agreement, as in and by said license agreement now in your orators' possession and in Court to be produced, to which your orators pray leave to refer, whereby the said Oregon Hassam Paving Company became the exclusive licensee to use and make under said patents in this district.

XXI.

And your orators further aver that your orator, the Oregon Hassam Paving Company, was organized particularly to exploit and develop said inventions in this district; that it has made a large investment for this purpose; that it has had made and constructed large amounts of pavements which in construction and mode of operation embody the invention or discovery described and claimed in said three letters patent number 819,652, number 861,650 and number 851,625; that the said inventions or discoveries have been recognized in this district as of a high order of excellence; that the pavement constructed thereunder has been put in many streets in this district; and that

the exclusive right of your orator, the Oregon Hassam Paving Company, to use and make pavements under said patents, has been and still is, of great benefit and advantage and is the basis of a large and substantial business in this district. That particularly in the City of Portland in the State of Oregon, the business of your orator the Oregon Hassam Paving Company, has been and is extensive and profitable in laying pavements under said patents, and at that place your said orator has invested a large amount of capital, aggregating many thousands of dollars, in advertising and introducing the said pavement and demonstrating the advantage thereof for municipal use as a street pavement, and in providing the machinery and implements used in laying said pavements, and has taken many contracts from the City of Portland prior to the filing of this bill of complaint for the laying of said pavements, and has actually laid and constructed said pavements under said patents upon many streets in the said city. That some of the work of laying said pavements is now under way and uncompleted, and other pavements have been fully completed. And that the City of Portland has now before its various officers and its executive board and council, proceedings for the improvement of many other streets with said pavement, which proceedings are pending and uncompleted, but in due course will result in the advertising for bids and the letting of contracts for the improvement of many streets with said pavement embodying the invention and discovery described in and claimed in the said three letters pat-

ent, number 819,652, number 861,650 and number 851,625.

XXII.

And your orators further aver that upon every pavement or artificial structure made by them and by said licensees and containing the invention of said three several letters patent, numbers 819,652, 861,650 and 851,625, sufficient notice has been given to the public that the same is patented by affixing thereon the word "Patented," together with the day and year the said three several letters patent were respectively granted.

XXIII.

Your orators further aver that the said defendants, well knowing the premises, without license or right, in violation and infringement of said letters patent and of the exclusive right thereunder granted and secured as aforesaid, and since your orator, the Hassam Paving Company, has been the exclusive owner of said patents, and since your orator, the Oregon Hassam Paving Company, has been the licensee as aforesaid, under said patents, and within the period of six years last past and prior to the filing of this bill of complaint in the City of Portland, has infringed each and all of the claims of each and all of the said letters patent and has made, sold and used, and is now making, selling and using and threatens to continue to make, sell and use pavements and artificial structures which contain the inventions covered and secured by

said three several letters patent, numbers 819,652, 861,650 and 851,625, and that in each of the said pavements and artificial structures made, sold and used by the said defendants, all of the inventions described in and claimed by the said three several letters patent were conjointly combined and used, but how much pavement and artificial structure the said defendants have made, sold or used, or caused to be made, sold or used in the infringement of your orator's aforesaid patents, numbers 819,652, 861,650 and 851,625, your orators are ignorant and cannot set forth.

XXIV.

And your orators further aver that the said defendants, since the granting of said letters patent, have been duly notified of their infringement thereof but have continued after such notice to make, use and sell pavements and artificial structures in infringement of said three several letters patent, numbers 819,652, 861,650 and 851,625, and in defiance of your orators' aforesaid vested rights.

XXV.

And your orators further aver that the City of Portland in Oregon, duly adopted an ordinance entitled "Ordinance number 21,172; an ordinance in relation to the improvement of streets and declaring an emergency," which said ordinance was passed by the Council of the said City on the 27th day of April, 1910, and was approved by the Mayor of the said City on the 4th day of May, 1910, and in and by the said or-

dinance the said City of Portland adopted specifications governing the laying of so-called "Hassam Pavement" within the said City of Portland, which said specifications contain the inventions covered and secured by the said three several letters patent, numbers 819,652, 861,650 and 851,625, and by the provisions of Section 28 of the said ordinance it was and is provided that said Hassam pavement when laid on the streets of said City shall be as follows:

"SECTION 28. The roadway shall be graded the full width of the roadway down to subgrade as given by the City Engineer. Said subgrade shall be six (6) inches below the finished surface of the street.

Care must be taken to preserve the proper crown. All soft or springy places not affording a firm foundation shall be dug out and refilled with good earth, gravel or macadam, well rammed in place.

The entire roadbed shall be thoroughly rolled and compacted with a road roller weighing not less than ten tons, to the satisfaction of the City Engineer. Such rolling shall be completed in sections of at least one block and shall be tested and accepted by the City Engineer before any material for the pavement is placed thereon.

Rolling shall be continued until the street is rolled to the satisfaction of the City Engineer.

The thickness of pavement shall be not less than six (6) inches from subgrade to the finished grade of street.

Upon the finished subgrade clean, broken rock, ninety per cent. of amount varying in size from two and one-half ($2\frac{1}{2}$) inches to one and one-half

(1½) inches, shall be spread to a sufficient depth to bring the surface after rolling to the proper finished grade of the street, which shall be six (6) inches above subgrade.

This rock shall then be thoroughly compacted by rolling with a road roller, giving a compression of not less than 250 pounds per inch width of roller, and shall be firmly bedded, and the voids reduced to a minimum, and surface shall conform to grade and contour of the street. Such portions of pavement as it may not be possible to roll shall be thoroughly compressed by tamping.

The voids in the rock shall then be thoroughly filled with a grout consisting of one part of Portland cement to two parts of sand. This grout shall be sufficiently thin to flow freely, and shall be thoroughly and continuously mixed and poured upon the rock until all the voids are filled and the grout flushes to the surface under the rolling or compression, which shall immediately follow the grouting and shall be continued until no further compacting results.

Upon the surface of the pavement thus prepared shall be placed a very thin layer of peastone, which shall be thoroughly spread and rolled or compressed evenly and smoothly over the entire surface. The peastone layer shall have just sufficient thickness to insure the complete filling of the voids in the pavement surface. Rolling shall continue until the grout flushes to the surface.

After rolling, this surface shall, at the discretion of the City Engineer, be broomed until surplus water is removed and the surface presents a true and even appearance.

Suitable expansion joints shall be provided at

the curb or across the street as the City Engineer may decide necessary and so direct.

A template, the upper edge of which conforms to the contour of the finished grade, shall be placed transversely across the street at the point where the work of each day stops. This template shall be removed before continuing the grouting, care being taken not to disturb the set of the cement next to the template.

All operations shall be carried forward with as much speed as is possible, and in no case shall cement be rolled or compressed or worked after it has taken its initial set.

All paving shall be kept free from traffic for a period of not less than six (6) days after its completion, and longer if necessary in judgment of the City Engineer, before being opened up to the public for use.

The rock for making the concrete shall be the best hard, dark-colored, sound basalt rock, or granite, or equally hard stone, not less than ninety per cent. broken in pieces not longer than two and one-half ($2\frac{1}{2}$) inches in the largest diameter, nor smaller than one and one-half ($1\frac{1}{2}$) inches in diameter.

The broken rock shall be screened so that all dust, clay, loam, vegetable matter and pieces smaller than one-half ($\frac{1}{2}$) inch in diameter shall be removed. The rock shall be thoroughly washed if considered necessary by the City Engineer.

All sand must be clean, coarse and sharp; it must range uniformly from fine to coarse. All must pass a sieve having four meshes per linear inch and not more than ten per cent. must pass a sieve having thirty meshes per linear inch.

In measuring the aggregate, one sack of cement shall be taken as equal to one cubic foot. If barrel cement is used, a barrel shall be taken as four cubic feet.

And your orators pray that the said ordinance may be deemed and taken as part of this bill, and to the original of, to a duly authenticated copy thereof now in your orators' possession and in court to be produced, your orators pray leave to refer.

XXVI

And your orators further aver that in September, 1910, the Council of the said City of Portland, deeming it expedient and necessary to improve Commercial Street from the north line of Skidmore Street to the south line of Killingsworth Avenue in the said City, directed the City Engineer of said City to prepare plans and specifications for such improvement, and also estimates of the work to be done and the probable cost thereof, and the City Engineer did prepare such plans, specifications and estimates and did file them in the office of the City Auditor of the City of Portland on the 21st day of January, 1911; and subsequently the said City Council approved the said plans, specifications and estimates and determined the boundaries of the district benefited and to be assessed for such improvement, and on the 8th day of February, 1911, the said Council adopted a resolution, being its resolution numbered 3031, declaring its purpose to make the said improvement, describing the same as Hassam pavement, and

adopting such engineer's estimate of the probable cost thereof and also defining the boundaries of the assessment district to be benefitted and assessed therefor, and notices were published and posted by the officers of the said City in the manner and form required by the City Charter and due proofs of the publication and of the posting thereof were filed with the Auditor of said City. That thereafter the Council of the said City adopted its ordinance numbered 22,941, providing for making said improvement, and authorizing the letting of a contract for the same conforming in all particulars to the plans and specifications previously adopted as aforesaid, and to the provisions of said ordinance numbered 21,172.

That the plans and specifications and the said ordinances require the use of pavements and structures which combine all of the inventions claimed by your orators under the said patents.

That no remonstrance or petition against the said improvement was filed, and the Mayor of the said City approved the said ordinance and the Auditor of the said City was directed to advertise for bids and did advertise for bids for said work, and that the defendant Consolidated Contract Company offered a bid and the contract was awarded by the City of Portland to the said defendant Consolidated Contract Company and was entered into between the City of Portland and the said defendant for the performance of the said work and the making of the said improvement, a substantial copy of which said contract is as follows:

“THIS AGREEMENT, made this 17th day of May, A. D. 1911, by and between Consolidated

Contract Co., a corporation (hereinafter called the Contractor), and The City of Portland, by its Executive Board (hereinafter called said City),

WITNESSETH: That the Contractor, for the consideration hereinafter named, does hereby agree to furnish the material and perform the labor necessary or required under the provisions of Ordinance No. 21172 and Ordinance No. 22941 of said City, and the plans and specifications of the City Engineer of said City, for the improvement of Commercial Street from the north line of Skidmore Street to the south line of Killingsworth Avenue, and to complete said improvement and all work thereon in a skillful, workmanlike and substantial manner and to the satisfaction of the Executive Board of said City, on or before the 17th day of October, A. D. 1911; said work to be performed and completed in strict accordance with the provisions and requirements of the Charter of said City and Ordinance of said City No. 21172 and No. 22941, and the plans and specifications of the City Engineer on file in the office of the Auditor of said City, which charter provisions, ordinances, plans and specifications are hereby referred to and made a part of this contract; and the Contractor hereby agrees to perform all of the work provided by this contract in such good, skillful and substantial manner that no repairs shall be required to said improvement for a period of five years after its completion and acceptance by said City, and if, during said period, any defects shall appear in said improvement which are attributable in any manner to defective materials or workmanship, the Contractor hereby undertakes and guarantees to repair such defects

at his own expense, and when so ordered by the Executive Board of said City; and said Contractor hereby further undertakes and guarantees to hold said City, and its officers, free and harmless from all loss or damage that may result from carelessness or negligence in the performance of said work, and to assume the entire responsibility for such loss or damage.

The said work shall commence within ten days after the awarding of this contract and shall be prosecuted with such vigor that all work embraced in this contract shall be entirely completed by the 17th day of October, 1911;

It is hereby further agreed that in view of the character of the work to be done, said City will suffer damages as provided for in Ordinance No. 19745 of said City (which ordinance is hereby referred to and made a part of this contract), for each and every day that the completion of said work is delayed beyond the 17th day of October, 1911; and it is further agreed that in case said work shall not be completed on or before said date, the Contractor shall pay to said City, as fixed and liquidated damages, the amount provided by said Ordinance No. 19745, for each and every additional day required to complete said work, which damages shall be retained out of any money due, or to become due, under this contract.

The said work shall be performed under the personal supervision of the Contractor and no part of this contract, nor any interest therein, shall be sublet, assigned or transferred without the written consent of said City, by its Executive Board, and no such written consent shall release the Contractor from any obligation, either to said City, or to

the persons employed by any sub-contractor, and all sub-contractors shall be considered merely as employes of the Contractor and may be discharged by said City for incompetency, neglect of duty or misconduct. The City Engineer of said City shall decide all questions which may arise between the parties hereto relative to the true intent and meaning of any of the provisions or stipulations contained in this contract, or the amount, quantities, character or classification of the work performed by the Contractor under this contract, and his decision thereon shall be final and binding upon the Contractor, subject only to modification or reversal by the Executive Board of said City. The Contractor further agrees to dismiss, at the request of said City Engineer, any sub-contractor, foreman, workman, or other employe, whom either said City Engineer or the Contractor shall deem unfit for the duties assigned to him, or who shall be guilty of slighting work, disobedience of orders, improper or disorderly conduct; and the Contractor shall not again employ any person so dismissed from the work, or suffer him to be so employed.

Whenever, in the opinion of said City Engineer, the work is not being prosecuted by the Contractor with sufficient vigor to insure its completion within the time specified in this contract, or if the character of the work or materials is not in accordance with the Charter, ordinances, plans and specifications above referred to, the said City Engineer may serve written notice on the Contractor to at once put on additional forces of men and teams, or to use such appliances or tools, or to cause such improvement in the character of

the work or materials used therein, as may be required, in order that the Contractor may conform to the stipulations of this agreement and said Charter, ordinances, plans and specifications; and if, at the expiration of five days after such notice is given (which notice may be served upon the Contractor in person, or upon some person engaged in the work representing him), he shall have failed to comply with said notice, said City may immediately take full control of the whole or any portion of the work and complete the same, and of all tools, teams, machinery, materials and other outfit and appliances belonging to the said Contractor and in use on said work; employ such additional men and teams, and use such additional appliances, tools and materials as may, in the judgment of said City Engineer, be necessary or requisite to complete the work in the time and manner specified herein. If, upon the completion of the work by said City, the cost thereof is found to be less than the prices herein agreed to be paid to the Contractor, the difference between the actual cost and the contract price shall be paid to the Contractor, which final payment shall be made within a reasonable time after the work is completed. If, however, the actual cost of the work so done shall exceed the cost of the same at the prices herein specified, the Contractor agrees that he will, on demand, repay to said City the amount expended by it in excess of the cost of the work at the prices named herein, and such excess of cost shall be recoverable on the bond of the Contractor, hereinafter mentioned. None of the foregoing provisions shall be construed to require said City to complete the work, nor to waive or in any way

limit or modify the provisions of this contract relating to the fixed and liquidated damages suffered by said City on account of the failure of the Contractor to complete said work within the time herein prescribed.

In consideration of the faithful performance of the agreements made herein by the Contractor, said City hereby agrees to pay the Contractor, upon the completion of said improvement and its approval and acceptance by the Executive Board, the amount due under this contract, computed upon the corrected estimate of the City Engineer at the unit prices named in the proposal of the Contractor, a copy of which proposal is embodied in and made a part of this contract. Such payment shall be made by warrants drawn on the special assessment fund which may be collected in the City Treasury for that purpose. The following is a copy of the proposal of the Contractor:

PORTLAND, Oregon, Apr. 28, 1911.

TO THE EXECUTIVE BOARD:

The undersigned proposed to furnish material and perform the labor necessary for the improvement of Commercial Street from North line of Skidmore Street, to south line of Killingsworth Ave. in the manner provided by Ordinance No. 22941 at the unit prices set opposite the different items of material and work as follows, to-wit:

Items.		Dollars.	Cents.	Total.
Excavation—Earth,	per cubic yard		80	\$1,840.80
Excavation—Old Macadam,	per cubic yard			
Embankment—Earth,	per cubic yard		10	10
Embankment—Crushed rock,	per cubic yard	2	50	2.50
Artificial Stone Sidewalk,	per square foot		12	358.08
Artificial Stone Curb,	per lineal foot		40	198.96
Wood Sidewalk, 6 ft. wide without curb,	per lineal foot			
Wood Sidewalk . . . feet wide,	per lineal foot			
Wood Curb,	per lineal foot			
Wood Crosswalk—New,	per lineal foot			
Wood Crosswalk—Relay,	per lineal foot			
Box Gutter—Wood,	per lineal foot			
Box Gutter—Wood, open as per plans,	per lineal foot			
Stone Gutter,	per lineal foot			
Stone Block Header, double row,	per lineal foot			
Wood Header,	per lineal foot		15	40.65
Cast Iron pipe 6" diam.,	per lineal foot		75	37.50
¼-inch pipe for water service connections,	per lineal foot		60	144.00
Vitrified Pipe, 8-inch diam- eter, surface drainage,	per lineal foot		60	66.00
Vitrified Pipe, 6-inch diam- eter, sewer service con- nection,	per lineal foot		50	450.00
Inlets,	each	25	00	175.00
"Y" Branches, 6-inch diam- eter,	each	1	00	24.00
Brick Cutter,	per square yard			
Concrete Gutter, 2 feet wide,	per square yard			
Bitulithic Pavement,	per square yard			
Asphalt,	per square yard			
Vitrified Brick Pavement, exclusive of foundation,	per square yard			
Concrete Pavement,	per square yard			
Hassam Pavement,	per square yard	1	75	23,272.90
Stone Block Pavement, ex- clusive of foundation,	per square yard			
Concrete in Track, 6 inches thick,	per square yard			
Concrete, 6 inches thick,	per square yard			
Macadam,	per cubic yard			
Gravel,	per cubic yard			
Concrete Retaining Wall, as per plans,	per cubic yard			
Iron Guard Fence,	per lineal foot			
Lumber, B. M.,	per M			
Clearing and Grubbing,				
	Total			26,610.49

Amended Bill of Complaint.

And I hereby agree that in case I am the lowest bidder for such work and this, my bid, is rejected for informality, that it shall be optional with the City of Portland either to award said contract to the next highest bidder whose bid is found to be regular, or to readvertise for said work. And in case said City of Portland determines to readvertise for said work, I agree that the expense of such readvertisement shall be borne by me, and the said City of Portland shall have the right to cash the check accompanying this bid, and out of the proceeds thereof to pay for such readvertisement, and the balance remaining after paying for such readvertisement is to be returned to me.

CONSOLIDATED CONTRACT COMPANY,
By J. H. JOHNSON, President,
Contractor.

It is expressly agreed that this contract is upon the condition that said Contractor will look alone for payment for the material and work above contracted for, to the special assessment fund created by assessment upon the property benefited by such improvement collected and paid into city treasury for that purpose, and to the owners of the real property within the assessment district, and the Contractor shall in no event require said City, or any of its officers to pay the same, excepting out of such special fund so assessed and collected into the city treasury for such purpose, nor to seek to enforce the payment of the same, or any part thereof, against said City, or any of its officers, by legal process or otherwise, or out of any other funds, or in any manner otherwise than as herein provided.

It is hereby agreed by the Contractor that this contract is subject to the provisions of the

Charter of said City and of Ordinance No. 9183 of said City, providing for the protection of sub-contractors, material, men, laborers and mechanics furnishing labor or material under this contract.

For the faithful and punctual performance of this contract the Contractor hereby agrees to furnish a good and sufficient bond in the penal sum of \$26,610.49 to be approved by the Mayor of said City, and having as surety thereon some surety company authorized to do business in the State of Oregon, or having personal surety or sureties thereon to be approved in the same manner, and further indemnifying said City against all claims or liens for labor, work or material on account of all sub-contractors, material men, mechanics and employes furnishing labor or materials under this contract, or in the improvement specified in this contract.

IN WITNESS WHEREOF, The parties above named have caused this agreement to be executed in duplicate on the day and year first above written.

[CORPORATE SEAL]

CONSOLIDATED CONTRACT COMPANY [SEAL]

J. H. JOHNSON, President [SEAL]

E. G. TITUS, Secretary [SEAL]

THE CITY OF PORTLAND [SEAL]

By JOSEPH SIMON,
Chairman of the Executive
Board of the City of Portland.

Executed in
presence of:

.....
.....

Amended Bill of Complaint.

(Endorsed:—Letter C, Page 64—CONTRACT—
 CONSOLIDATED CONTRACT Co.,
 Contractor for the improvement
 of COMMERCIAL STREET from
 north line of Skidmore St. to
 south line of Killingsworth Ave.

Form Approved,
 FRANK S. GRANT,
 City Attorney.
 By H. M. TOMLINSON,
 Deputy.

Filed May 20, 1911,
 A. L. BARBOUR,
 Auditor of the City
 of Portland,
 By E. W. JONES,
 Deputy.

That the said contract was duly executed by the said defendant Consolidated Contract Company by J. H. Johnson, its president and E. G. Titus, its secretary, and by the City of Portland by Joseph Simon, Chairman of the Executive Board of said City, under date the 17th day of May, 1911, and was duly filed with the Auditor of the said City of Portland on the 20th day of May, 1911, where it still remains of record. And your orators pray that copies of the said proceedings, including the said resolutions, ordinances, plans, specifications and estimates and said contract herein referred to, may be deemed and taken as a part of this bill and that your orators have leave to pro-

duce authenticated copies thereof and to refer to the same as part of this bill.

That in accordance with the terms and requirements of the said contract and the charter and ordinances above referred to, the said defendant Consolidated Contract Company executed its bond to the said City of Portland, with the said Pacific Coast Casualty Company, defendant, as surety thereon, in the penal sum of \$26,610.49, a substantial copy of which said bond is as follows:

PACIFIC COAST CASUALTY COMPANY

Head Office, San Francisco, California

Know All Men By These Presents, That we, CONSOLIDATED CONTRACT COMPANY, as principal, and the PACIFIC COAST CASUALTY COMPANY, a corporation, organized under the laws of the State of California, and authorized to act as surety under the laws of the State of Oregon, as surety, are held and firmly bound unto the City of Portland in the penal sum of TWENTY-SIX THOUSAND SIX HUNDRED AND TEN AND 49/100 DOLLARS (\$26,610.49), lawful money of the United States, for the payment whereof well and truly to be made, we, and each of us, jointly and severally, bind ourselves, our and each of our heirs, executors, administrators, successors and assigns, firmly by these presents.

THE CONDITIONS OF THIS OBLIGATION ARE SUCH, That whereas the above bounden principal CONSOLIDATED CONTRACT COMPANY, did on the 17th day of May, A. D. 1911, enter into contract with the City of Portland for the improvement of COMMERCIAL STREET, FROM THE NORTH

LINE OF SKIDMORE STREET TO THE SOUTH LINE OF KILLINGSWORTH AVENUE, according to the plans and specifications therefor, and in accordance with the provisions of Ordinances No. 22944 and No. 14253, as amended, of the City of Portland, and in compliance with the provisions of Ordinance No. 9183 and the Charter of the City of Portland.

NOW, THEREFORE, if the said principal shall well and faithfully perform and observe each and every of the covenants and conditions in said contract contained, and perform all of the work embraced by said contract in such good, skillful and substantial manner that no repairs shall be required to said improvement for a period of FIVE years after its completion and acceptance by said City, and if said principal shall, during said period, repair, at its own cost and expense and when so ordered by the Executive Board of said City any and all defects that may appear in said improvement which are attributable in any manner to defective material or workmanship, and further indemnify and save harmless said City against all claims or liens for labor, work or material on account of all sub-contractors, material, men, laborers or mechanics furnishing labor, work or material under said contract, and fully secure and pay the just claims of all laborers, material men, and sub-contractors, employed by them thereunder, then this obligation shall be void, otherwise to remain in full force and effect.

IN WITNESS WHEREOF, the said principal CONSOLIDATED CONTRACT and the said surety has caused these presents to be signed by its duly

authorized officer and its corporate seal to be hereto attached this 17th day of May, 1911.

CONSOLIDATED CONTRACT COMPANY, [SEAL]
J. H. JOHNSON, President, [SEAL]
[CORPORATE SEAL] E. G. TITUS, Secy. [SEAL]
SEELEY & Co.,
City Agents

PACIFIC COAST CASUALTY COMPANY
By PHILLIP GROSSMAYER,
[CORPORATE SEAL] Attorney-in-Fact.

(Endorsed) — C-64 — 199.56 — CONTRACT BOND
CONSOLIDATED CONTRACT COMPANY, Contractor for improvement of COMMERCIAL STREET, From Skidmore Street To Killingsworth Ave.

FORM APPROVED

Frank S. Grant, City Attorney

By.....
Deputy

Approved—May 20—1911

Joseph Simon
Mayor

Filed—May 20, 1911

A. L. Barbour
Auditor of the City of Portland
By E. W. Jones, Deputy

PACIFIC COAST CASUALTY COMPANY
PETTIS-GROSSMAYER Co.,
General Agents,
311-312-313-314-315 Board of Trade
Building
Portland, Oregon.

Which said bond your orators pray may be deemed and taken as a part of this bill and to the original or a duly authenticated copy thereof now in your orators' possession and in court to be produced, your orators pray leave to refer.

XXVII.

And your orators further aver that under and by the terms of the said contract and bond and the said ordinances, the said defendants have contracted and agreed and undertaken to and are actually proceeding to make, use and sell the same pavement and structures that are the inventions described in and claimed by your orators under their three said letters patents number 819,652, number 861,650 and number 851,625, embodying and conjointly using in one and the same structure the several inventions covered by the said patents and claimed by your orators, and have entered upon said Commercial Street and have begun to lay down the said pavement thereon.

XXVIII.

And your orators aver that other proceedings are pending before the municipal officers of the City of Portland for the improvement of streets with Hassam pavement embodying and necessitating the use of the inventions claimed by your orators under the said patents, and that it is the desire of the City of Portland to advertise for and receive bids for other contracts for such improvements, but that the defendants claim the right to, and threaten to and will, unless restrained,

bid upon and offer to do and perform such work, and enter into contracts therefor. That your orator, Oregon-Hassam Paving Company, on account of its being the sole licensee under the said patents having the exclusive right to make, use and sell the said inventions in said City, and because of its investment and expenditures, in introducing the use of said pavement and in the necessary plant and equipment for doing the said work, as herein above shown, is able and ready to undertake all such work. That because of said wrongful claims and threats of the defendants and the uncertainty of the officers of the said City occasioned thereby as to the rights of bidders to enter into such contracts and to perform the same and to make use of and to sell the said pavements and artificial structures, the said officers will decline to proceed or to let contracts for Hassam pavement or to carry on any improvement that involves the use of the said pavements and artificial structures, so that your orators will lose the opportunity of getting such work, and their plant and equipment will be idle, whereby your orators suffer great, special and irreparable damage and injury.

XXIX.

And your orators further aver that the infringement above complained of by the defendants is a great and continuing injury to them; that said infringement is interfering with the business of making, selling and using, and licensing others to make, use and sell, pavements and artificial structures described and claimed in said letters patent, numbers 819,652, 861,650 and

851,625, and your orators further aver that unless the defendants are restrained by writ of injunction issuing out of this Court, the said defendants will continue to infringe said patents and will induce and lead others to infringe said patents and thereby will cause irreparable injury to your orators' aforesaid rights.

YOUR ORATORS THEREFORE PRAY your Honors to grant unto your orators a preliminary and also a permanent writ of injunction issuing out of and under the seal of this Honorable Court, directed to the said Consolidated Contract Company and the said Pacific Coast Casualty Company, and strictly enjoining them, and each of them, their agents and employees, not to make, use or sell, or cause to be made, used or sold, any pavement or artificial structure which will contain or employ the inventions covered and secured by the claims of said letters patent numbers 819,652, 861,650 and 851,625, or any of them, and especially enjoining the defendants, and each of them, and their agents and employees, not to make, use or sell, or cause to be made, used or sold, upon Commercial Street in the City of Portland, any pavement or artificial structure which will contain or employ the said inventions or any thereof.

AND YOUR ORATORS FURTHER PRAY that the defendants, and each of them, by a decree of this Court, may be compelled to account to and pay to your orators, all the profits which they may have derived from any making, using or selling of any pavements or artificial

structures covered and secured by said letters patent or any of them, and that also the defendants and each of them be decreed to pay all damages which your orators have incurred or shall incur upon account of the said defendants' infringement of the said several letters patent numbers 819,652, 861,650 and 851,625 with such increase thereof as shall seem meet.

YOUR ORATORS FURTHER PRAY that the defendants be decreed to pay the cost of this suit and that your orators may have such other and further relief as the equity of the cause or the statutes of the United States require and to this Court may seem just.

TO THE END THEREFORE that the defendants may, if they can, show why your orators should not have the relief prayed, it is prayed that the defendants, according to the best and utmost of their knowledge, remembrance, information and belief, make full, true, direct and perfect answer to the matters hereinbefore stated and charged, but not under oath, answer under oath being hereby expressly waived; and to the end, therefore, that your orator may have such recovery and relief, may it please your Honors to grant unto your orators, not only a writ or writs of injunction conformable to the prayer of this bill, but also a writ of subpœna *ad respondendum* issuing out of and under the seal of this Honorable Court and directed to the said defendants Consolidated Contract Company and Pacific Coast Casualty Company and commanding them and each of them to appear before this Court

then and there to answer this bill and to abide by such decree herein as to this Court shall seem just.

HASSAM PAVING COMPANY,

By W. A. LUEY.

OREGON HASSAM PAVING COMPANY,

By B. ASSMAN,

Secretary.

CAREY AND KERR,

1410 Yeon Building,

Portland, Oregon,

Solicitors for Complainants.

LOUIS W. SOUTHGATE,

339 Main Street, Worcester, Mass.,

Of Counsel for Complainants.

STATE OF OREGON, }
County of Multnomah, } ss.:

B. ASSMAN, being duly sworn, deposes and says that he is the Secretary of OREGON HASSAM PAVING COMPANY, one of the complainants above named; that he has read the foregoing amended bill of complaint and knows the contents thereof and that the same is true of his own knowledge, except as to the matters therein stated to be alleged on information and belief, and as to those matters he believes it to be true.

B. ASSMAN.

Subscribed and sworn to before me }
this 11th day of April, 1912. }

G. C. FRISBIE,

[NOTARIAL SEAL.]

Notary Public for Oregon.

IN THE
DISTRICT COURT OF THE UNITED STATES
FOR THE DISTRICT OF OREGON.

HASSAM PAVING COMPANY, a
corporation, and OREGON HAS-
SAM PAVING COMPANY, a cor-
poration,

Complainants,

vs.

CONSOLIDATED CONTRACT COM-
PANY, a corporation, and PA-
CIFIC COAST CASUALTY COM-
PANY, a corporation,

Defendants.

IN EQUITY.
ANSWER.

TO THE JUDGES OF THE DISTRICT COURT OF THE
UNITED STATES FOR THE DISTRICT OF OREGON:

The Consolidated Contract Company, and the Pacific Coast Casualty Company, both defendants above named for answer to complainant's amended Bill of Complaint filed herein, admits, denies and alleges as follows, to wit:

I.

Admit that the HASSAM PAVING COMPANY is a corporation duly organized and existing under the laws of the State of Massachusetts, with its principal place of business in the City of Worcester, Massachusetts; that the OREGON HASSAM PAVING COMPANY is a corporation created and existing

under the laws of the State of Oregon, and having its principal place of business in the City of Portland; that the defendant, Consolidated Contract Company, is a corporation duly organized and existing under the laws of the State of Oregon, and a resident of said State; that the defendant, Pacific Coast Casualty Company, is a corporation organized and existing under the laws of the State of California and a resident of that State with an office in and engaged in business within the State of Oregon.

II.

Defendants deny that prior to the 7th day of June, 1905, or at any other time, one Walter E. Hassam was the sole or original or first or any inventor of a certain or any new or useful invention entitled "Pavement and Process of Laying the Same," a description of which is to be found in the letters patent issued therefor by the Government of the United States, or otherwise, or at all.

III.

Deny that the said alleged pavement or process of laying the same was a new or useful invention and was not known nor used by others in this country before the alleged invention or alleged discovery thereof by the said Hassam, or which was not patented nor described in any printed publication in this or any foreign country before the alleged invention and discovery thereof by the said Hassam, or more than two years before his application for United States Letters Patent therefor, or that at the time of his application

for United States Letters Patent therefor, as set out in complainants' bill of complaint, had not been in public use or on sale in the United States for more than two years or was not patented or caused to be patented by him, or his legal representatives, or assigns, in any foreign country, or upon application which was filed more than twelve months prior to the filing of his said application in this country, nor that the same had not been abandoned by him.

IV.

Deny that the said Hassam was the original or first inventor of said or any paving or process of laying the same; that as to whether or not the said Hassam on the 7th day of June, 1905, or at any other time, or at all, duly or regularly filed, or otherwise filed, in the Patent Office of the United States, application in writing praying for the granting and issuance to him of letters patent of the United States for the same, these defendants have no knowledge or information sufficient to form a belief and therefore deny the same.

That as to whether or not that prior to the alleged granting and issuing of any patent therefor the said Hassam for value received, or at all, did by an instrument in writing under his hand and seal duly executed and witnessed or otherwise, or at all, sell, or assign, or transfer unto one Charles K. Pevey of Worcester, County of Worcester, State of Massachusetts, an undivided one-half interest or any interest in or to the said alleged invention or in which said Hassam in or by said alleged assignment did

request the Commissioner of Patents to issue such patent as might be granted upon such application, or any patent to the said Walter E. Hassam and Charles K. Pevey, or either of them, jointly or otherwise; or as to whether or not such alleged assignment in writing was filed and recorded in the Patent Office of the United States prior to the granting of any issuance of patent for said invention, or at any other time, or at all, these defendants have no knowledge or information sufficient to form a belief, and therefore deny the same.

That as to whether or not after proceedings duly or regularly had or taken in the matter of said alleged application on May 1, 1906, or at any other time, letters patent of the United States bearing date on that day, or any other date, and numbered 819,652, or any other number were granted or issued and delivered by the Government of the United States to said Walter E. Hassam and Charles K. Pevey, jointly or otherwise, whereby there was granted to them, or either of them, or their heirs or assigns, for the term of 17 years, from the first day of May, 1906, or otherwise, the sole or exclusive or any right, liberty or privilege to make, use or vend the said alleged invention throughout the United States of America, or the territories thereof, or elsewhere, these defendants have no knowledge or information sufficient to form a belief and therefore deny the same.

VI.

That as to whether or not the said alleged letters patent of the United States were issued in due form of

law, or otherwise, in the name of the United States, or under the seal of the Patent Office of the United States, or were signed by the Commissioner of Patents of the United States; or as to whether or not prior to the issuance thereof, all proceedings were had and taken which were required by law to be had and taken prior to the issuance of letters patent for new and useful inventions, these defendants have no knowledge or information sufficient to form a belief and therefore deny the same.

VII.

That as to whether or not that before the alleged infringement complained of in complainants' complainant said Walter E. Hassam and said Charles K. Pevey, or either of them, by an instrument in writing, or otherwise, duly signed or sealed or delivered by them, and recorded in the United States Patent Office, did sell, or assign, or transfer to the Hassam Paving Company, all of the right or title or interest in or to said alleged invention, or in or to said alleged letters patent No. 819,652, alleged to have been obtained thereon, together with all right, claims or demands, or cause of action for past infringement of said alleged letters patent; or as to whether or not ever since the said alleged execution and delivery of said alleged assignment, the said Hassam Paving Company has been or still is the sole or exclusive or any owner of said alleged letters patent, these defendants have no knowledge or information sufficient to form a belief and therefore deny the same.

VIII.

Defendants deny that prior to the 30th day of November, 1906, or at any other time, or at all, the said Walter E. Hassam was the sole original or first or any inventor of a certain or new or useful invention entitled, "Artificial Structure and Process of Making the Same", as shown or set forth in a certain patent alleged to have been issued therefor by the Government of the United States referred to in Paragraph VIII of complainants' complaint, or otherwise, or at all.

IX.

Deny that said artificial structure or process of making the same was a new or useful invention which was not known or used by others in this country before the alleged invention and discovery thereof by the said Hassam, or which was not patented nor described in any printed publication in this or any foreign country before the alleged invention and discovery thereof by the said Hassam, or more than two years before his alleged application for United States patent therefor; nor at the time of his said alleged application for United States letters patent therefor, as set forth in complainants' complaint, the same had not been publicly used or on sale in the United States for more than two years, nor that the same is not patented or caused to be patented by him or by his legal representatives or assigns in any country upon an application which was filed more than twelve months prior to the filing of his said alleged application in this country, or that the same had been abandoned by him.

X.

Deny that the said Walter E. Hassam was the original or first inventor of said artificial structure and process of making the same; that as to whether or not on the said 30th day of November, 1906, the said Hassam duly or regularly filed in the Patent Office of the United States an application in writing praying for the granting and issuance to him of letters patent of the United States for the same; or as to whether or not that prior to the granting and issuance of any patent therefor, the said Hassam for value received, or otherwise, did by an instrument in writing under his hand and seal, duly witnessed and executed, sell, or assign or transfer unto the Hassam Paving Company, all or any of the right, title or interest in or to said alleged invention, or did in or by said alleged assignment request the Commissioner of Patents to issue such patents as might be granted upon said application to said Hassam Paving Company; or as to whether or not said alleged assignment in writing was filed or recorded in the Patent Office of the United States prior to the granting or issuance of any patent for said alleged invention, these defendants have no knowledge or information sufficient to form a belief and therefore deny the same.

XI.

That as to whether or not on the 30th day of July, 1907, or at any other time letters patent of the United States bearing date as of that day, or any other date, and numbered 861,650, or any other number were

granted or issued or delivered by the Government of the United States to the Hassam Paving Company, granting it, or its legal representatives or assigns for the term of 17 years from said 30th day of July, 1907, the sole or exclusive right, liberty or privilege to make, or use or vend the said alleged invention throughout the United States of America, or elsewhere; or as to whether or not that ever since the alleged issuance of said letters patent to the said Hassam Paving Company it has been or still is the sole or exclusive or any owner of said letters patent, these defendants have no knowledge or information sufficient to form a belief and therefore deny the same.

XII.

That as to whether or not said alleged letters patent of the United States were issued in due form of law in the name of the United States, or under the seal of the Patent Office of the United States, or was signed by the Commissioner of Patents of the United States; or as to whether or not prior to the issuance therefor, all proceedings were had or taken which were required by law to be taken, prior to the issuance of letters patent for new and useful inventions; or whether or not said letters patent are ready in court to be produced by complainants, or a copy thereof, these defendants have no knowledge or information sufficient to form a belief and therefore deny the same.

XIII.

Deny that prior to the 14th day of November, 1906, or at any other time the said Walter E. Hassam was

the sole or original or first or any inventor of a certain new or useful invention entitled, "Process for Laying Pavement," as described in the letters patent issued therefor by the Government of the United States, or otherwise, or at all.

XIV.

Deny that said alleged process for laying pavement was a new or useful invention which was not known or used by others in this country before the alleged invention and discovery thereof by the said Hassam, or that the same was not patented or described in any printed publication in this or any foreign country before the alleged invention and discovery thereof by the said Hassam for more than two years before his alleged application for United States letters patent therefor, as alleged in complainants' bill of complaint; or that the same had not been publicly used or on sale in the United States for more than two years, or was not patented nor caused to be patented by him, or by his legal representatives in any foreign country upon any application in this country; or that the same had not been abandoned by him.

XV.

Deny that the said Hassam was the original, or first or any inventor of said process for laying pavement; and as to whether or not the said Hassam did on the 14th day of November, 1906, or at any other time, duly or regularly file in the Patent Office of the United States an application in writing praying

for the granting and issuance to him of letters patent of the United States for the same; or as to whether or not that prior to the granting and issuing of any patent therefor, the said Hassam for value received, did by an instrument in writing, under his hand and seal duly witnessed and executed, sell, or assign or transfer to the Hassam Paving Company all or any of the right, title or interest in or to the said alleged invention; or as to whether or not the said Hassam did in or by said assignment request the Commissioner of Patents to issue such patent as might be granted upon such application to the Hassam Paving Company; or as to whether or not said assignment in writing was filed and recorded in the Patent Office of the United States prior to the granting or issuance of any patent for said alleged invention, these defendants have no knowledge or information sufficient to form a belief and therefore deny the same.

XVI.

That as to whether or not after proceedings were duly and regularly had and taken in the matter of the said alleged application on April 23rd, 1907, or at any other time, letters patent of the United States, bearing date on that day, or any other day, and numbered 851,-625, or any other number, were granted or issued and delivered by the Government of the United States to the Hassam Paving Company wherein and whereby there was granted to it, or its assigns, or legal representatives, for the term of 17 years, or any other period, from the said 23rd day of April, 1907, the sole or

exclusive right, liberty or privilege to make or use or vend said invention throughout the United States of America, or the territories thereof; or as to whether or not ever since the issuance of said letters patent, the Hassam Paving Company are still the sole or exclusive or any owner or holder of said alleged letters patent, these defendants have no knowledge or information sufficient to form a belief and therefore deny the same.

XVII.

That as to whether or not said letters patent of the United States were issued in due form of law or in the name of the United States, or under the seal of the Patent Office of the United States, or were signed by the Commissioner of Patents of the United States; or as to whether or not prior to the issuance thereof all proceedings were had or taken which were required by law to be had and taken prior to the issuance of letters patent for new or useful inventions, there defendants have no knowledge or information sufficient to form a belief and therefore deny the same.

XVIII.

Deny that all of said alleged inventions described in and claimed by said alleged three letters patent No. 819,652, No. 861,650 and No. 851,625, respectively, or any of said patents, are capable of embodiment or conjoint use in one and the same structure, or have been so embodied and conjointly used by complainant, or will be so embodied and conjointly used by the de-

defendant, Consolidated Contract Company in its alleged threatened infringement complained of in complainants' bill of complaint.

XIX.

That as to whether or not the Hassam Paving Company was organized particularly or at all to exploit or develop said alleged inventions, or that it made a large investment for this purpose, or that it, or its licensees have made or constructed large amounts of pavements which in construction or mode of operation embody the alleged invention and discovery described and claimed in said three letters patent No. 819,652, No. 861,650 and No. 851,625, or any of them; or as to whether or not said alleged inventions or discoveries have been recognized throughout the United States, or elsewhere as a high or any order of excellence, or as to whether or not the pavement constructed thereunder has been adopted as the standard by many or any municipalities or any highway commissions, or as to whether or not the rights covered by said alleged several patents have been acquiesced in generally, or otherwise by the public throughout the United States, or elsewhere, with the exception of these defendants, or as to whether or not the alleged exclusive right to control the same has been or still is of great benefit or advantage to complainant, or is the basis of a large and substantial business, these defendants have no knowledge or information sufficient to form a belief and therefore deny the same.

XX.

That as to whether or not the Hassam Paving Company on or about the 16th day of July, 1909, or at any other time, gave and conveyed unto the Oregon Hassam Paving Company, the exclusive right to use and make said alleged improvements in pavements and foundations, or processes of laying the same according to the three alleged several letters patent, during the term beginning the 16th day of July, 1909, or any other time, or ending with the expiration of the term of said letters patent, or any other time, in the State of Oregon, or a strip in the southern part of the State of Washington, as described in complainant's bill of complaint, upon the payment of certain license fees or royalties, or upon certain or any conditions contained in said alleged license agreement, or upon any other conditions, or at all; or as to whether or not the said Oregon Hassam Paving Company became the exclusive or any licensee to use and make under said alleged patents in this district said alleged or any pavement, these defendants have no knowledge or information sufficient to form a belief and therefore deny the same.

XXI.

That as to whether or not the Oregon Hassam Paving Company was organized particularly or otherwise to exploit or develop said alleged inventions in this district, or as to whether or not it has made a large or any investment for this purpose, or has made or constructed large amounts of pavements which in construction and mode of operation embody the alleged invention or dis-

covery described and claimed in said three letters patent, No. 819,652, No. 861,650 and No. 851,625, or either of them, or as to whether or not the said alleged inventions or discoveries have been recognized in this district as of a high order of excellence, or that the pavement constructed thereunder has been put in many streets in this district, these defendants have no knowledge or information sufficient to form a belief and therefore deny the same.

Deny that the Oregon Hassam Paving Company has the exclusive right to use or make pavements under said alleged patent; that as to whether or not said alleged right has been or still is of great or any benefit or advantage, or is the basis of a large and substantial business in this district; or as to whether or not in the City of Portland and State of Oregon, the business of the Oregon Hassam Paving Company has been or is extensive or profitable in laying pavements under said alleged patents; and as to whether or not the said Paving Company has in the City of Portland invested a large or any sum of capital, aggregating many thousands of dollars, or any sum, or sums in advertising or introducing the said pavement, or demonstrating the advantage thereof for municipal use as a street pavement, or in providing the machinery or implements used in laying said pavements, or has taken many contracts from the City of Portland prior to the filing of complainants' bill of complaint herein for the laying of said pavements, or has actually or at all laid or constructed said pavements under said alleged patents upon many or any streets in this City these defendants have no

knowledge or information sufficient to form a belief and therefore deny the same.

That as to whether or not that some or any of the work is now under way or uncompleted or that other pavements have been fully completed, or as to whether or not the City of Portland has now before its various officers, or any of its officers or executive board and council, proceedings for the improvement of many streets or any streets with said pavement, or which proceedings are now pending or uncompleted or which in due course will result in the advertising for bids and letter of contracts for the improvement of many or any streets with said pavement embodying the invention or discovery described in and claimed in said alleged three letters patent No. 819,652, No. 861,650 and No. 851,625, these defendants have no knowledge or information sufficient to form a belief and therefore deny the same.

XXII.

That as to whether or not complainants have affixed upon every or any pavement or artificial structure made by them containing the alleged invention of the three several letters patent, numbered as above, the word "Patented," or any other word, or the day or year the three alleged several letters patent were respectively granted, these defendants have no knowledge or information sufficient to form a belief and therefore deny the same.

XXIII.

Deny that these defendants, or either of them, well knowing, or at all knowing the premises, are without

license or right or in violation or infringement of said alleged letters patent, or in violation or infringement of any exclusive, or other rights thereunder granted or secured as alleged in complainants' bill of complaint, or since the Hassam Paving Company has claimed to be the exclusive owner of said alleged patents, or since the Oregon Hassam Paving Company has claimed to be the licensee under said alleged patents, or within the period of six years last past prior to the filing of complainants' bill of complaint in the City of Portland, or otherwise, or at all, has infringed each, or any, or all of the claims of each, or any, or all of the said alleged letters patent, or has made or sold, or used, or is now making, or using, or threatening to continue to make, or sell or use pavements or artificial structures lawfully patented or covered or secured by said alleged three several letters patent No. 819,652, No. 861,650 and No. 851,625, or either of them, or that in each or any of said improvements or artificial structures made, sold or used by these defendants, or either of them, all or any of the inventions described in or claimed by the three said several letters patent, were unlawfully conjointly combined or used.

XXIV.

Admit that the defendant, Consolidated Contract Company, since the date of the granting of said alleged letters patent, have been notified that they were infringing the same, but deny that they have continued after such notice to make, or use or sell pavements or artificial structures in infringement of said

alleged three several letters patent, except in the improvement of Commercial Street from the north line of Skidmore Street to the south line of Killingsworth Avenue, in the City of Portland, as hereinafter set forth; and deny that such use was in defiance of complainants' vested rights or any right whatever.

XXV.

Admit that the City of Portland adopted Ordinance No. 21,172, which was entitled, "An Ordinance in relation to the improvement of Streets and declaring an Emergency," on the 27th day of April, 1910.

Admit that in and by said Ordinance, the City of Portland adopted said specifications governing the laying of several kinds of pavement, but deny that any pavement is officially referred to as "Hassam Pavement." And deny that said specifications contain the inventions or any inventions covered or secured by the said three alleged letters patent No. 819,652, No. 861,650 and No. 851,625.

Admit that Section 28 of said Ordinance contains the language set out in quotation on pages 17, 18 and 19 of complainants' amended bill of complaint.

XXVI.

Admit that in September, 1910, the Common Council of the City of Portland directed the City Engineer of said City to prepare plans and specifications for the improvement of Commercial Street from the north line of Skidmore Street to the south line of Killingsworth Avenue; and that the said City Engineer

did prepare such plans and specifications and did file them in the office of the Auditor of the City of Portland on the 21st day of January, 1911; and that said plans and specifications were approved by the City Council and that on the 21st day of February, 1911, the said Council adopted a resolution, being Resolution No. 3031, declaring its purpose to make the said improvement as set forth in Paragraph XXVI of complainants' amended bill of complaint. But as to whether or not the same was described as Hassam Pavement in said Resolution, these defendants have no knowledge or information sufficient to form a belief, and therefore deny the same.

Admit that notices were published and posted by the officers of said City and that thereafter the City Council of said City adopted its Ordinance No. 22,941 providing for making said improvement and authorized the letting of the contract for the same, conforming in all particulars to the plans and specifications previously adopted, as aforesaid, and to the provisions of said Ordinance No. 21,172; but as to whether or not the said plans and specifications, or the said ordinances required the use of pavements, or structures which combined all or any of the alleged inventions claimed by complainants under said alleged patents, these defendants have no knowledge or information sufficient to form a belief and therefore deny the same.

Admit that no remonstrance or petition against said improvement was filed and that the Mayor of said City approved the said Ordinance alleged in com-

plainants' amended bill of complaint, and the auditor of said City was directed to advertise for bids and did advertise for bids for said work.

That defendant, Consolidated Contract Company, offered a bid and said contract was awarded by the City of Portland to the said defendant, Consolidated Contract Company, and was entered into between the City of Portland and the said defendant, for the performance of the said work and for the making of said improvement, and that the agreement set out on pages 21, 22, 23, 24, 25 and 26 of complainants' amended bill of complaint is a correct copy of said agreement as entered into.

Admit that said contract was duly executed by the parties as alleged and was duly filed with the auditor of the City of Portland on the 20th day of May, 1911, and that it is still of record there, all as alleged in complainants' amended bill of complaint.

Admit that in accordance with the terms and requirements of said contract, and the Charter and Ordinances of the City of Portland, the said defendant, Consolidated Contract Company, executed its bond to the said City of Portland with the said Pacific Coast Casualty Company, defendant herein, as surety thereon, in the penal sum of \$26,610.49, and that said bond is as set forth on pages 27 and 28 of complainants' amended bill of complaint.

XXVII.

Deny that in or by the terms of said contract, or bond, or the said ordinance, or any of them, the said

defendants, or any of them, have contracted or agreed, or undertaken to, or are actually, or at all proceeding to make, or use, or sell the same pavement and structures, or any pavement or structures, or the inventions described in or claimed by complainants under their three said alleged letters patent, or are embodying or conjointly or otherwise using in one or the same structures the several or any inventions covered by said alleged patents, or claimed by complainants, or have entered upon said Commercial Street, or have begun to lay the same pavement thereon, save and except as hereinafter set forth.

XXVIII.

That as to whether or not other proceedings are pending before the municipal officers of the City of Portland for the improvement of Streets with Hassam Pavement, embodying or necessitating the use of the alleged inventions claimed by complainants under said alleged patents, or that it is the desire of the City of Portland to advertise for or receive bids for other contracts for such improvements, these defendants have no knowledge or information sufficient to form a belief and therefore deny the same.

Admits that the defendant, Consolidated Contract Company, will, unless restrained by your Honorable Court, bid upon and offer to do and perform such work and enter into contracts therefor under the plans and specifications as prepared by the City of Portland.

That as to whether or not said Oregon Hassam Paving Company is able or ready to undertake any

or all of such work, these defendants have no knowledge or information sufficient to form a belief and therefore deny the same.

Deny that because of said alleged wrongful claims or threats of defendants, or any of them, or of the alleged uncertainty of the said City occasioned thereby as to the rights of the bidders to enter into such contracts, or perform the same, or to make use of, or sell said pavements, or artificial structures, that said officers will decline to proceed to let contracts for Hassam Pavement, or to carry on any improvement that involves the use of said pavements or artificial structures, or that complainants will lose the opportunity of getting such work, or that their plant or equipment will be idle, or that they will suffer great, or special or irreparable damage or injury thereby.

XXIX.

Deny that the alleged infringement as set forth in complainants' amended complaint by these defendants is a great or continuing or any injury to complainants, or that said alleged infringement is interfering with the business of making, or selling or using or licensing others to make or use or sell pavements or artificial structures described in or claimed by said alleged letters patent Nos. 819,652, 861,650 and 851,625, or either of them; or that, unless these defendants are restrained by right of injury, or otherwise, or at all, they will continue to infringe or have infringed said alleged patents, or will induce or let others infringe

said alleged patents, or will thereby cause irreparable or any injury to complainants.

These defendants for a first further and separate answer and defense allege:

I.

That the "Pavement and Process of Laying the Same," the "Artificial Structure and Process of Making the Same," and "Process for Laying Pavement," mentioned in the amended bill of complaint in Articles II to XVIII, both inclusive, and therein alleged to have been discovered and invented by Walter E. Hassam of Worcester, Massachusetts, and for which it is also therein alleged that letters patent Nos. 819,652, 861,650 and 851,625 were issued embodying the claims and specifications of said alleged discoveries and inventions, and the specifications for pavement and the process of laying the same mentioned in Article XXV of said amended bill and therein alleged to embody the inventions covered and secured by said three several letters patent, have been described and specified in United States Letters Patent granted and issued to persons other than said Walter E. Hassam, or his assigns, and said patents were each and all granted and issued more than two years, and many years prior to the date of said Hassam's alleged invention or discovery and prior to June 7, 1905, being the earliest date on which it is alleged in said amended bill that said Hassam filed his written application in the Patent Office of the United States praying for the granting of letters patent to him to secure his alleged discovery and invention.

II.

That the United States Letters Patent hereinafter mentioned cover and include the claims and specifications described in said three letters patent numbered 819,652, 861,650 and 851,625, mentioned as aforesaid in said amended bill, and the said specifications for pavement and the process for laying the same set forth in Article XXV of said amended complaint, to-wit:

Patent No. 238,706 to John Murphy of Columbus, Ohio, Inventor and Patentee, issued March 8, 1881, and published in Vol. 19 of the Official Gazette, page 590, and described in certified copy of specifications in the Portland Public Library, in the City of Portland, Oregon, under said patent number.

Patent No. 375,273, issued December 20, 1887, to Edward J. De Smedt, Washington, D. C., Inventor and Patentee, published in the Official Gazette, Vol. 41, page 1371, and described in certified copy of specifications in the Portland Public Library in said City of Portland, under said patent number.

Patent No. 381,667, issued December 28, 1887, to George A. Bayard, Bellfonte, Pa., Inventor and Patentee, published in the Official Gazette, Vol. 43, page 4635, and described in certified copy of the specifications in Portland Public Library in said City of Portland under said patent number.

Patent No. 401,752, issued November 19, 1888, to Mordicai Levi, Charleston, W. Va., Inventor and Patentee, published in Official Gazette, Vol. 47, page 413, and described in certified copy of the specifications in Portland Public Library in the City of Portland under said patent number.

Patent No. 413,278, issued October 22, 1888, to Thomas F. Hagerty, San Francisco, California, Inventor and Patentee, published in Official Gazette, Vol. 49, page 452, and described in the certified copy of the specifications in Portland Public Library in said City under said patent number.

III.

That the pavement and process for laying the same as claimed and specified in said three letters patent numbered 819,652, 861,650 and 851,625, and as set forth in said Article XXV of said amended complaint had been described in many printed publications more than two years before and many years prior to said Hassam's alleged invention and discovery as set forth in said amended bill. Among the books and printed publications, in which said alleged invention or discovery of said Hassam is described, in addition to the Official Gazette above mentioned, are the following: March's Thesaurus, Century Dictionary and other dictionaries, under "Grout," "Macadamization."

Encyclopedia Americana, under "Roads and Highways, Improvement of".

Encyclopedia Britannica, 9th Edition under the title "Roads and Streets".

"Concrete Plain and Reinforced", 2nd Edition, a treatise by Frederick W. Taylor and Sanford E. Thompson.

"Roads and Pavements", by Ira O. Baker, 1st Edition.

IV.

That said Walter E. Hassam was not the original or first inventor of any material and substantial part of the pavement and process for laying the same, described in said three letters patent numbered 819,652, 861,650 and 851,625 mentioned as aforesaid in said amended bill of complaint. Substantially the same pavement and process for laying the same was described and used by John L. Macadam, a Scotch Engineer born in the year 1756 and who died about 1836, the road being known as Macadam road; and the same kind of pavement and process for laying the same, except that asphalt or bitumen instead of Portland cement is used for a binder, has been used in Portland, Oregon, and many other cities by Warren Construction Company for a long time prior to said alleged invention and discovery of said Walter E. Hassam and for more than two years prior to his application for a patent therefor; and said pavement and the process for laying the same as specified in said three patents alleged in said amended bill has been in use in this country and foreign countries for many years and has been within the knowledge of engineers and road makers since a time long prior to said Hassam's alleged discovery or invention.

V.

By reason of the patents issued to persons other than said Walter E. Hassam, or his assigns, as above set forth and the printed publications describing the pavement and the process of laying the same according

to the specifications set forth in Article XXV of said amended bill, and the knowledge and use by persons other than complainants of the pavement and process of laying the same as described in said three patents of complainants long prior to the alleged invention of said Hassam and of the prior state of the art all of which was well known to said Hassam at the time of said Hassam's alleged discovery or invention, the said pavement and process of laying the same, as described in complainants' three patents mentioned in said amended bill was not patentable, for lack of novelty and invention, and said patents are therefore void.

These defendants for a second further and separate answer and defense to complainants' amended bill of complaint filed herein, allege:

I.

That on the 27th day of April, 1910, the City of Portland, through its Common Council, duly adopted an Ordinance, being Ordinance No. 21172 and entitled, "An Ordinance in Relation to the Improvement of Streets and Declaring an Emergency", which said Ordinance was duly approved by the Mayor of said City on the 4th day of May, 1910. That by the said Ordinance the City of Portland adopted specifications governing the laying of all kinds of pavements for streets and sidewalks and the manner of constructing the same and the material to be used for that purpose.

That Section 28 of said Ordinance provides as follows:

"Section 28. The roadway shall be graded the full width of the roadway down to subgrade

as given by the City Engineer. Said subgrade shall be six (6) inches below the finished surface of the street.

Care must be taken to preserve the proper crown. All soft or springy places not affording a firm foundation shall be dug out and refilled with good earth, gravel or macadam, well rammed in place.

The entire roadbed shall be thoroughly rolled and compacted with a road roller weighing not less than ten tons, to the satisfaction of the City Engineer. Such rolling shall be completed in sections of at least one block and shall be tested and accepted by the City Engineer before any material for the pavements is placed thereon.

Rolling shall be continued until the street is rolled to the satisfaction of the City Engineer.

The thickness of pavement shall be not less than six (6) inches from subgrade to the finished grade of street.

Upon the finished subgrade clean, broken rock, ninety per cent. of amount varying in size from two and one-half ($2\frac{1}{2}$) inches to one and one-half ($1\frac{1}{2}$) inches, shall be spread to a sufficient depth to bring the surface after rolling to the proper finished grade of the street, which shall be six (6) inches above subgrade.

This rock shall then be thoroughly compacted by rolling with a road roller, giving a compression of not less than 250 pounds per inch width of roller, and shall be firmly bedded and the voids reduced to a minimum, and surface shall conform to grade and contour of the street. Such portions of pavement as it may not be possible to roll shall be thoroughly compressed by tamping.

The voids in the rock shall then be thoroughly

filled with a grout consisting of one part of Portland cement to two parts of sand. This grout shall be sufficiently thin to flow freely, and shall be thoroughly and continuously mixed and poured upon the rock until all the voids are filled and the grout flushes to the surface under the rolling or compression, which shall immediately follow the grouting and shall be continued until no further compacting results.

Upon the surface of the pavement thus prepared shall be placed a very thin layer of peastone, which shall be thoroughly spread and rolled or compressed evenly and smoothly over the entire surface. The peastone layer shall have just sufficient thickness to insure the complete filling of the voids in the pavement surface. Rolling shall continue until the grout flushes to the surface.

After rolling, this surface shall, at the discretion of the City Engineer, be broomed until surplus water is removed and the surface presents a true and even appearance.

Suitable expansion joints shall be provided at the curb or across the streets as the City Engineer may decide necessary and so direct.

A template, the upper edge of which conforms to the contour of the finished grade, shall be placed transversely across the street at the point where the work of each day stops. This template shall be removed before continuing the grouting, care being taken not to disturb the set of the cement next to the template.

All operations shall be carried forward with as much speed as is possible, and in no case shall cement be rolled or compressed or worked after it has taken its initial set.

All paving shall be kept free from traffic for a period of not less than six (6) days after its completion, and longer if necessary in judgment of the City Engineer, before being opened up to the public for use.

The rock for making the concrete shall be the best hard, dark-colored, sound basalt rock, or granite, or equally hard stone, not less than ninety per cent. broken in pieces not larger than two and one-half ($2\frac{1}{2}$) inches in the largest diameter, nor smaller than one and one-half ($1\frac{1}{2}$) inches in diameter.

The broken rock shall be screened so that all dust, clay, loam, vegetable matter and pieces smaller than one-half ($\frac{1}{2}$) inch in diameter shall be removed. The rock shall be thoroughly washed if considered necessary by the City Engineer.

All sand must be clean, coarse and sharp; it must range uniformly from fine to coarse. All must pass a sieve having four meshes per linear inch and not more than ten per cent. must pass a sieve having thirty meshes per linear inch.

In measuring the aggregate, one sack of cement shall be taken as equal to one cubic foot. If barrel cement is used, a barrel shall be taken as four cubic feet."

II.

Section 374 of the Charter of the City of Portland, duly adopted by the legal voters of the City of Portland, in June, 1902, went into effect January 23, 1903, and which is now the Charter of the City of Portland, provides that the Council of said City whenever it may deem it expedient may order the whole or any

part of the streets of the City to be improved and to determine the character, kind and extent of such improvement.

Section 375 of said Charter provides that when the Council shall deem it expedient or necessary to improve any street or streets within the City of Portland, it shall require plans and specifications from the City Engineer for an appropriate improvement, and the estimates of the work to be done and the probable costs thereof. And if the Council shall find such plans, specifications and estimates to be satisfactory, it shall approve the same and shall by resolution declare its purpose of making said improvement.

Section 376 of said Charter provides that the City Engineer within five days from the first publication of said resolution, shall cause notices to be posted at each end of the line of the contemplated improvement.

Section 377 provides that within twenty days from the date of the first publication of the notices required to be published in preceding section, that the property owners may remonstrate against said improvement.

Section 378 of said Charter provides that if no objection or remonstrance be made and filed with the auditor within the time designated, the Council shall be deemed to have acquired jurisdiction to order the improvement to be made, and the Council thereafter, and within three months from the date of the final publication of its previous resolution may, by ordinance, provide for making said improvement which shall conform in all particulars to the plans and specifications previously adopted.

Section 379 of said Charter provides :

“Section 379. Upon the approval of said ordinance by the Mayor, or if the same shall become valid without his approval, the auditor shall present to the Executive Board, at its next regular meeting, a copy of said ordinances, and the estimates, plans and specifications previously prepared by the City Engineer and adopted by the Council. Thereafter the said Executive Board, without delay, shall give notice by publication for not less than five successive days in the city official newspaper, inviting proposals for making said improvement. The Executive Board shall have the power to award the contract or contracts for said improvement and to impose such conditions upon bidders with regard to bonds and securities, and guarantees of the good faith and responsibility of bidders, for insuring the faithful completion of the work in strict accordance with the specifications therefor, and to make all rules and regulations in the letting of contracts that may be considered by said Board as advantageous to the city. Such contract or contracts shall be let to the lowest responsible bidder for either the whole of said improvement or such part thereof as will not materially conflict with the completion of the remainder thereof, but said Board shall have the right to reject any or all proposals received. It shall be the duty of the Executive Board to fix the time in which every such improvement shall be completed and it may extend such time should the circumstances warrant. The said Board shall have power and authority to make all written contracts, to receive and approve all bonds authorized by this section, to provide for

the proper inspection and supervision of all work done under the provisions of this Article, and to do any other act to secure the faithful carrying out of all contracts, and the making of improvements in strict compliance with the ordinance and specifications thereof.”

III.

That in the year 1910, and prior to the 27th day of April, of said year, and prior to the passage of said Ordinance No. 21,172, the complainants herein well knowing the provisions of the City Charter of the City of Portland hereinbefore set forth, and well knowing that all contracts for the improvement of streets were under said Charter required to be let to the lowest responsible bidder, and well knowing that all persons were allowed and permitted to bid thereon, solicited and requested the officers, agents and servants of the said City of Portland to incorporate in said Ordinance No. 21,172, Section 28 thereof, hereinbefore set forth, and prepared and furnished to the City Engineer of the City of Portland and to the Common Council of the said City a draft of said Section 28 as the same appears in said Ordinance and as hereinbefore set forth, and without reserving to complainants, or either of them, any royalty upon their alleged patents No. 819,652, 861,650 and 851,625, and thereby gave its consent that the officers and agents of the City of Portland should specify that kind of an improvement and to advertise for and receive bids for the improvement of streets with that kind of an improvement and to let the same to the lowest responsible bidder.

IV.

In the month of September, 1910, the Common Council of the City of Portland, deeming it expedient and necessary to improve Commercial Street from the north line of Skidmore Street to the south line of Killingsworth Avenue in said City, directed the City Engineer of said City to prepare plans and specifications for such improvement and also estimates of the work to be done and the probable cost thereof. The said Engineer did prepare such plans and specifications and estimates and did file them in the office of the City Auditor of the City of Portland on the 21st day of January, 1911, and subsequently the said City Council approved the said plans and specifications and estimates and determined the boundaries of the district benefited and to be assessed for such improvement and on the 8th day of February, 1911, the said Council adopted a resolution, being its Resolution No. 3031, declaring its purpose to make said improvement and describing the same and adopting such Engineer's estimate of the probable cost thereof, and also defining the boundaries of the assessment district benefited and assessed therefor, and notices were published and posted by the officers of said City in the manner and form required by the City Charter and due proofs of the publication and of the posting thereof were filed with the Auditor of said City.

That thereafter the Council of said City adopted its Ordinance No. 22,941, providing for making said improvements and authorizing the letting of a contract for the same conforming in all particulars to the plans

and specifications previously adopted as aforesaid, and to the provisions of said Ordinance No. 21,172.

That no remonstrance or petition to the said improvement was filed and the Mayor of the said City approved said Ordinance and the proper officers of the said City were directed to advertise for bids for said work which said advertisement so published by authority of the City of Portland, reads as follows:

“PROPOSALS FOR IMPROVEMENT OF COMMERCIAL STREET.”

“Sealed proposals will be received at the office of the Auditor of the City of Portland, until Friday, April 28, 1911, at 4 o'clock p. m., for the improvement of Commercial Street, from the north line of Skidmore Street to the south line of Killingsworth Avenue, in the manner provided by Ordinance 22,941, subject to the provisions of the charter and Ordinances of the City of Portland, and the estimate of the City Engineer on file.

Bids must be strictly in accordance with printed blanks, which will be furnished on application at the office of the Auditor of the City of Portland. And said improvement must be completed on or before five months from the date of the signing of the contract by the parties thereto.

No proposal or bid will be considered unless accompanied by a check payable to the order of the Mayor of the City of Portland, certified by a responsible bank for an amount equal to ten per cent of the aggregate proposal, to be forfeited as fixed and liquidated damages in case the bidder neglects or refuses to enter into contract and provide a suitable bond for the faithful performance of said

work in the event the contract is awarded to him and the contract for the improvement of the above named street will be awarded to the lowest responsible bidder for the whole of the improvement.

The right to reject any and all bids is hereby reserved."

By order of the Executive Board.

(Signed) A. L. BARBOUR,

Auditor of the City of Portland.

Portland, Oregon, April 22, 1911.

That in pursuance of said proceedings and of said advertisement for bids, the defendant, Consolidated Contract Company, offered a bid for the improvement of said street and it being the lowest responsible bidder, the contract for the improvement of said street was awarded by the City of Portland to said defendant. And a contract was entered into between the City of Portland and said defendant for the performance of said work and the making of said improvement, a substantial copy of which contract appears upon pages 21, 22, 23, 24, 25 and 26 of complainants' amended bill of complaint, and thereafter proceeded to construct said street and to make said improvements in accordance with said plans and specifications.

VI.

That by reason of said complainants herein having solicited and procured the said City of Portland to specify the kind of pavement and the manner of laying the same, as set forth in Section 28 of said Ordinance 21172, well knowing that under the said charter of the City of Portland the said City would be compelled,

if said kind of improvement and the manner of laying the same was specified for the improvement of the street, that the contracts for the improvement thereof would have to be let to the lowest responsible bidder for said improvement the said complainants are therefore estopped by their conduct and acts aforesaid from claiming that the said improvement specified at their request was patented and are estopped from claiming any royalties or damages from these defendants, and are estopped from denying that they had waived their patent right, if any they had, upon such street so improved under said contract by the defendants, Consolidated Contract Company.

WHEREFORE, Defendants pray for a decree of your Honorable Court dismissing complainants' amended bill of complaint as being without equity, and decreeing that defendants recover of and from complainants their costs and disbursements of this suit.

CONSOLIDATED CONTRACT COMPANY,
By E. G. TITUS,
Secretary.

PACIFIC COAST CASUALTY COMPANY,
By PHILIP GROSSMAYER,
Attorney in Fact.

JESSE STEARNS,
JOHN H. HALL,

Solicitors for Defendants,
515 Railway Exchange.

IN THE
DISTRICT COURT OF THE UNITED STATES,
FOR THE DISTRICT OF OREGON.

HASSAM PAVING COMPANY, a
corporation, and OREGON HAS-
SAM PAVING COMPANY, a cor-
poration,

Complainants.

vs.

CONSOLIDATED CONTRACT COM-
PANY, a corporation, and PA-
CIFIC COAST CASUALTY COM-
PANY, a corporation,

Defendants.

} Replication.

THE REPLICATION OF COMPLAINANTS TO THE ANSWER
OF DEFENDANTS:

These repliants, saving and reserving to themselves all, and all manner of advantage of exception to the manifold insufficiencies of the said answer, for replication thereunto say, that they will aver and prove their said bill to be true, certain, and sufficient in the law to be answered unto; and that the said answer of the said defendants is uncertain, untrue, and insufficient to be replied unto by these repliants; without this, that, any other matter or thing whatsoever in the said answer contained, material or effectual in

the law to be replied unto, and not herein and hereby well and sufficiently replied unto, confessed and avoided, traversed or denied, is true; all which matters and things these repliants are and will be, ready to aver and prove, as this honorable Court shall direct; and humbly pray, as in and by their said bill they have already prayed.

Dated May 22, 1912.

CAREY & KERR,
Solicitors for Complainants.

LOUIS W. SOUTHGATE,
Of Counsel.

IN THE
DISTRICT COURT OF THE UNITED STATES
FOR THE DISTRICT OF OREGON.

HASSAM PAVING COMPANY, a corporation, and OREGON HASSAM PAVING COMPANY, a corporation,

Complainants,

vs.

CONSOLIDATED CONTRACT COMPANY, a corporation, and PACIFIC COAST CASUALTY COMPANY, a corporation,

Defendants.

WORCESTER, Mass., June 3, 1912.

Met pursuant to the annexed Notice of Taking Testimony, at the offices of Southgate & Southgate, at 10 A. M.

PRESENT:

LOUIS W. SOUTHGATE, ESQ., of counsel for Complainants.

JOHN H. HALL, ESQ., of counsel for defendants.

Adjourned by agreement to same place Thursday, June 6, 1912.

WORCESTER, Mass., June 6, 1912, 10 A. M.

Met pursuant to adjournment.

Present—Counsel as before.

Counsel for Complainants offers in evidence a certified copy of letters patent No. 819,652, patented May 1, 1906, on a "Pavement and Process of Laying the Same," and the same is marked, "Complainants' Exhibit No. 1, Hassam First Patent, C. F. W., Notary Public."

Counsel for Complainants offers in evidence a certified copy of United States letters patent No. 851,625, patented April 23, 1907, on a "Process for Laying Pavement," and the same is marked "Complainants' Exhibit No. 2, Hassam Second Patent, C. F. W., Notary Public."

Counsel for Complainants offers in evidence a certified copy of United States letters patent No. 861,650, patented July 30, 1907, on an "Artificial Structure and Process of Making the Same," and the same is marked "Complainants' Exhibit No. 3, Hassam Third Patent, C. F. W., Notary Public."

Counsel for Complainants offers in evidence a copy under seal of the Patent Office, of all assignments of record up to, and including, May 15, 1912, affecting the title of said three several letters patent, and the same is marked, "Complainants' Exhibit No. 4, Assignment of Patents in Suit, C. F. W., Notary Public."

WALTER E. HASSAM, being called as witness on behalf of Complainants, and being first duly sworn by C. Forrest Wesson, Notary Public, testifies as follows:

Q. 1. What is your name, age, residence and occupation?

A. Walter E. Hassam, age forty-six years old, general manager of the Hassam Paving Company, residence #2 Beeching Street, Worcester, Mass.

Q. 2. Are you the Walter E. Hassam in whose name the three letters-patent here in suit were granted?

A. I am.

Q. 3. Please state your experience as a contracting and civil engineer, and particularly your experience which led up to the procuring of these patents.

Objected to by Defendants' counsel as immaterial.

A. I graduated from Norwich University in Vermont in 1887 with degree of Civil Engineer, Master of Science, served sixteen years as Assistant Engineer in the City of Worcester, having charge of the road construction and the water department as an engineer. Three years as Street Commissioner of Worcester, having complete charge of the construction of all the streets, sidewalks, etc., in the City of Worcester. I resigned, I think, June 23, 1906, and since that time have been General Manager of the Hassam Paving Company. During this period I was Engineer and Street Commissioner I devoted my whole time, or nearly my whole time, to the development and processes of improving and building roads.

Q. 4. Your first patent here in suit is dated May 1, 1906. After you secured this patent, please state what steps, if any, you took to introduce and develop the invention thereof into use.

Objected to by Defendants' Counsel as irrelevant and immaterial.

A. I interested some business men of money and formed a company called the "Hassam Paving Company," incorporated in the State of Massachusetts, and immediately started to promote and get work and started construction; also to form and organize companies in other states and license them to lay the Hassam pavement under our patent and have done this to an extent of thirteen or fourteen companies throughout the United States and Canada, one of which is the Oregon Hassam Paving Company of Portland, Oregon.

Q. 5. Will you please produce the contract or license given to the Oregon Hassam Paving Company?

Objected to by Defendants' Counsel as immaterial.

A. I do.

Counsel for Complainants offers the original license produced by the witness in evidence, and the same is marked, "Complainants' Exhibit No. 5, License to Oregon Hassam Paving Company, C. F. W., Notary Public."

Objected to by Defendants' Counsel as immaterial.

Q. 6. I notice that this contract is signed "Hassam Paving Company, By Walter E. Hassam, General

Manager” and that the seal of the Hassam Paving Company is affixed thereto. Is this your signature and the seal of the Hassam Paving Company?

A. It is.

It is stipulated between counsel that the original contract produced by the witness may be withdrawn as an exhibit, subject to inspection nevertheless, at any reasonable time by counsel and may be substituted by a copy.

Counsel for Defendants objects to the contract as irrelevant and immaterial.

Q. 7. Please state generally the character, amount of business and localities of business done by the complainant corporation, Hassam Paving Company, and its licensee's since it was organized.

Objected to by Defendants' Counsel as irrelevant and immaterial.

A. We have laid paving in something like sixty cities in the United States and Canada, reaching from Portland, Oregon, to Portland, Maine, and from Victoria, British Columbia, to St. Johns, N. B., laying the Hassam pavement or Hassam foundation with other wearing surface, nearly three million yards of paving. I can give approximately the cities that it has been laid in from memory, but I do not suppose I could give them all without looking at the records.

Q. 8. Will you please state from memory, as near as you can, the cities you referred to in your last answer.

Objected to by Defendants' Counsel as immaterial.

A. Maine: Portland, Biddeford, Lewiston, Westbrook; New Hampshire: Nashua, Manchester; Massachusetts: Gardner, Holyoke, Lynn, Haverhill, Springfield, Lawrence, Southbridge, North Adams, Lowell, Worcester, Brockton, Taunton, Somerville, Cambridge, Beverly, Boston, Newton, Fall River, Watertown, Brighton, Williamstown; Rhode Island: Newport; Connecticut: Derby, Hartford, Waterbury, New Haven, Shelton; New York: Niagara Falls, Mineola, L. I., Troy, Brooklyn; New Jersey: Kearney, Plainfield; Michigan: Saginaw; Missouri: Springfield, Independence, St. Joseph; Pennsylvania: Philadelphia, Coraopolis; District of Columbia: Washington; Virginia: Phoebus, Roanoke; California: Los Angeles, Belvidere, San Francisco, Alameda, Stockton; Oregon: Portland; Washington: Seattle, Chehalis; Canada: Montreal, Fredericton, N. B., New Westminster, St. Johns, N. B., Victoria, British Columbia. I think of another, Hillsboro, Texas, that is completed. That is I think, all for the moment.

Q. 9. Please state what features have led to this extensive introduction and use of what you have termed the Hassam pavement, and please define what you mean by the Hassam pavement.

Objected to by Defendants' Counsel as immaterial.

A. It is the durability of the paving and the easy way of construction, and the low cost. I mean by the Hassam pavement, the placing of uncoated stone on prepared earth foundation, the rolling or compressing the same to reduce the voids to a minimum, then

the grouting of the voids with the cement grout until the voids are filled, then by placing a suitable wearing surface on the said foundation.

Q. 10. You referred in your last answer to the low cost of this pavement. Will you please state generally about what the price received for this pavement has been?

A. From a dollar and forty-five cents up to as high as four dollars and ten cents, due to the conditions, both of labor, teams, and prices of material and also to the surface that is placed upon the top of the pavement.

Q. 11. You also referred to the durability of this pavement in one of your previous answers. Will you please state somewhat more in extent what you mean by this?

A. It is proven that the paving is very durable and that it is wearing well and giving satisfaction in nearly all places that we have laid it.

Q. 12. Has this particular pavement been put in localities and cities where it had been almost impossible to devise or lay a pavement which would stand the traffic conditions, and if so please give some specific instances.

Objected to by Defendants' Counsel as being leading and also immaterial.

A. It has been laid in places where the traffic was very heavy and where we have taken up other pavements that have been laid not over five years, to replace it with the Hassam paving. This has been done in Missouri and also in the City of Worcester. In

Missouri the brick street was taken up and in Worcester the Warren Bitulithic was taken up over a mile and relaid with the Hassam pavement and grouted with the granite block.

Q. 13. How has the Hassam pavement stood with relation to automobile traffic?

Objected to by Defendants' Counsel as immaterial.

A. We have found that it is standing the automobile traffic better than any paving that has been put on for state roads, or any paving known of the price of the paving. For instance, we laid a state road six years ago on the main thoroughfare between Worcester and New York, and it is in excellent condition today. This has something over six hundred automobiles passing over it per day, at a high rate of speed, as has been shown by the State Engineer taking count of the number that were passing.

Defendants Counsel objects to last part of answer, which refers to the State Engineer, as hearsay.

A. I can deliver these statistics if wanted.

Q. 14. Has the Hassam pavement been used for any automobile race construction, and if so please state fully concerning the same.

Objected to by Defendants' Counsel as immaterial.

A. We have built the Long Island Motor Parkway for the William K. Vanderbilt associates, on Long Island.

Q. 15. Is this the so-called "Vanderbilt Race-Course"?

A. It is.

Q. 16. Why was the Hassam pavement adopted on this Vanderbilt race-course, so far as you know?

Objected to by Defendants' Counsel as irrelevant and immaterial.

A. Mr. E. G. Williams, the Chief Engineer for the Vanderbilts, and Mr. Pardington, the Manager, came to New England to investigate the work we had done and I was called to Mr. Vanderbilt's office after that and the work was given to us without competition.

Q. 17. How long a stretch of the Hassam pavement was put on this automobile race-course?

A. About twelve miles.

Q. 18. Referring now in the general terms of your first patent, No. 819,652, will you please state if this construction has been used in all of the so-called Hassam pavements to which you have referred?

A. I think it has, yes, sir.

Q. 19. Please now refer to the Hassam second patent, No. 851,625, and state generally what percentage of the so-called Hassam pavement has been laid in accordance with the improvement of this patent. I am not asking you to qualify generally as a patent expert, but to answer this question in your understanding of your improvement covered by this patent, and as a civil engineer.

A. I think all of our work comes under this patent.

Q. 20. Please now refer to the Hassam third patent, No. 861,650, and state generally what percentage of the so-called Hassam pavement has been laid in accordance with the improvement of this patent.

A. I think all of our pavement comes under these three patents.

Q. 21. Perhaps you did not clearly understand my last question. This last patent covers a particular top layer of small uncoated stones. I am referring particularly to a pavement having this top surface. With this explanation please answer the last question; that is, what percentage?

A. In my judgment, probably eighty per cent.

Q. 22. Referring now to the business done by the licensee corporation, the Oregon Hassam Paving Company, and to the contract under which this company works, which is dated July 16, 1909, will you please state generally about how extensively this licensee company has worked under this contract, that is, about how much pavement it has laid in its territory since this contract was made?

Objected to by Defendants' Counsel as irrelevant and immaterial.

A. Approximately 46½ miles.

Q. 23. Will you please produce one of the circulars issued by this licensee company?

A. I do.

Counsel for Complainants offers the circular produced by the witness and the same is marked "Complainants' Exhibit No. 6, Circular of the Oregon Hassam Paving Company, C. F. W., Notary Public."

Objected to by Defendants' Counsel as incompetent and immaterial.

Q. 24. Has it not been the custom of the Hassam Paving Company and its licensee companies to use a plate giving the date of the first patent in suit, and if so will you please produce one of these plates?

A. Yes, and I do.

Counsel for Complainants offers in evidence the plate produced by the witness and the same is marked "Complainants' Exhibit No. 7, License Plate, C. F. W., Notary Public."

Objected to by Defendants' Counsel as incompetent and irrelevant as to the Oregon Company for the reason that the witness has not shown any present knowledge as to whether such stamp is affixed by said company or not.

Q. 25. How are these license plates used to your knowledge?

A. They are sent to the licensed companies with orders to place them in conspicuous places in the streets.

CROSS-EXAMINATION BY MR. HALL, DEFENDANTS' COUNSEL:

x-Q. 26. Is the Oregon Hassam Company still a licensee of the parent company?

A. It is.

x-Q. 27. Is not that business being now conducted by the parent company?

A. It is not.

x-Q. 28. Who is the manager of the Oregon Company?

A. My last knowledge, John H. Crane.

x-Q. 29. The parent company owns fifty-one per cent. or more of the stock of the Oregon Company, does it not?

A. It doesn't own any.

x-Q. 30. Has it at any time?

A. I think it has, yes, sir.

x-Q. 31. How long since it closed out its interest in the stock of that corporation?

A. I cannot give you the dates of that without the records.

x-Q. 32. Give it approximately.

A. Some time in 1911.

x-Q. 33. You have stated, Mr. Hassam, that for a period of sixteen years you were constantly employed as an engineer in the construction of roads, streets and highways within the State of Massachusetts, what kind of a quality of roads and streets were you constructing?

A. Macadam, gravel, brick, asphalt, Warren bitulithic, granite block, wood block. I think that is all.

x-Q. 34. Were you ever in the employ of the Warren Construction Company?

A. No, sir.

x-Q. 35. You have laid their pavement?

A. As engineer and inspector of it.

x-Q. 36. But as such engineer you were and are familiar with every detail of the laying of Warren bitulithic pavement?

A. I am familiar with every detail of the laying of the Warren bitulithic paving, but not the mixing process of the top at their plant.

x-Q. 37. You are familiar with every step in the process of laying macadam pavement?

A. Yes, sir.

x-Q. 38. In the laying of brick pavement, what kind of foundation did you use, or cause to be used?

A. Ordinarily, concrete foundation, mixed method.

x-Q. 39. Did you use the same in preparing a foundation for wooden block?

A. Yes, sir.

x-Q. 40. And in the preparation of a foundation for granite blocks?

A. Yes, sir.

x-Q. 41. In preparing a foundation where a road or street is to be constructed you usually prepare your sub-grade, do you not?

A. We do, yes, sir.

x-Q. 42. A certain distance below the street grade?

A. Certainly.

x-Q. 43. The next process was to roll the sub-grade with a heavy roller?

A. Sometimes, not always.

x-Q. 44. Now, where the Warren Construction people laid pavement, they laid upon the sub-grade, prepared as I have indicated, broken rock or crushed rock, did they not?

A. They did, yes, sir.

x-Q. 45. They then rolled the rock with a heavy roller to reduce the voids, did they not?

A. They did.

x-Q. 46. They afterwards applied their mat or surface of asphalt, or whatever mixture they used, and rolled that, did they not?

A. They did.

x-Q. 47. They then applied a coat of fine chipped rock after the wearing surface had been applied and rolled that with a roller sufficiently heavy to force it into the surface of the street, did they not?

A. They did.

x-Q. 48. Are you familiar with the above method of construction of street and highway by what is known as the Barber Asphalt Company?

A. I am, yes, sir.

x-Q. 49. Their method of construction is very nearly identical with that of the Warren Construction Company is it not, except in the use of the wearing surface?

A. No sir, I think it varies considerably.

x-Q. 50. They prepare the sub-grade practically the same, do they not?

A. They do.

x-Q. 51. And apply the crushed rock and roll it in practically the same way, do they not?

A. They do not.

x-Q. What difference is it?

A. They generally lay a concrete base by a mixed method of concrete, sand and stone from four to six inches thick.

x-Q. 53. Will you briefly describe the process of laying a macadam pavement?

A. I shouldn't call a macadam a pavement. From my understanding, simply a road. Macadam pavement is laid by the following process: The sub-grade is prepared, crushed stone is generally spread four inches

thick, of a 2½ inch size. This is rolled, then another coat of a smaller size stone is placed upon this and rolled, stone dust or sand is spread upon this stone and wet and rolled so it won't rattle.

x-Q. 54. You mean until the voids are filled as near as can be?

A. As near as can be, yes.

x-Q. 55. The dust or fine material used as a top dressing, which you have referred to, is called a binder, is it not?

A. Yes, sir.

x-Q. 56. When did you first begin the construction of what is here referred to as "Hassam pavement"?

A. In 1905.

x-Q. 57. Where?

A. In the City of Worcester.

x-Q. 58. What quantity of pavement did you construct in 1905 in the City of Worcester?

A. One street.

x-Q. 59. Where, that is what block?

A. Salem Street.

x-Q. 60. Between what other streets?

A. Between Myrtle and Madison and Park streets, with a granite block surface on them.

x-Q. 61. Was that street constructed under contract with the City?

A. No, sir, it was not.

x-Q. 62. Was it paid for by the City?

A. No, sir; it was done when I was Street Commissioner, by permission of the Mayor of Worcester.

x-Q. 63. At the expense of the City?

A. Yes, sir.

x-Q. 64. What is the difference between what you refer to in your direct testimony as "Hassam pavement" and "Hassam foundation"?

A. The Hassam pavement is laid with a 1 or 1 to 2 mixture of grout and a screening of pea stones spread upon it and rolled into the pavement, making it one solid homogeneous mass. In the foundation, the grout is 1 to 3 or 1 to 4 mixture, and after the concrete is set a sand cushion is placed over the concrete, the granite block, wood block, brick, or any material of that kind is laid upon this and then grouted with cement.

x-Q. 65. In your answer where you refer to "1 to 2," "1 to 3," or "1 to 4," you mean one part of cement to two, three and four parts of sand, do you not?

A. I do.

x-Q. 66. This mixture of cement is not new, is it?

A. As a grout?

x-Q. 67. No, the proportions.

A. No, sir.

x-Q. 68. You spoke in your direct testimony of the durability of Hassam pavement. There is none that has been laid longer than six years, is there?

A. No, sir.

x-Q. 69. Has not some of your licensee companies had a great deal of litigation and a great deal of protest from property holders over the quality of the Hassam pavement as a pavement?

A. I know of no litigation, but I think they have

had some dissatisfaction from property owners, but not any more so than they do, or as much as they do, over other classes of pavements.

x-Q. 70. Are you familiar with the decision recently handed down by the Oregon Supreme Court in the case wherein the Hassam pavement was in litigation with the State of Oregon, and rendering a decision against the pavement although on demurrer?

A. No sir, I am not.

x-Q. 71. About what rate per yard do you charge your licensees for the use of this pavement?

A. We have different ways of letting it. Where the licensee uses the patent, 15c per yard. Sometimes when we furnish steam rollers and mixers we charge more then.

x-Q. 72. Do you ever charge any less than 15c?

A. I do not think of any case where we have charged less on any pavement or any foundation.

x-Q. 73. Did you charge the City of Lowell less?

A. They laid the foundation. We always charge the same to everyone on a foundation, 10c. a square yard.

x-Q. 74. Will you examine this paper and state whether that is a form of contract prepared and used by your company?

A. This is our form for foundation, and foundation only.

Counsel offers this paper in evidence and the same is marked "Defendants' Exhibit No 1."

x-Q. 75. As I understand you, the usual price to licensees for pavement is 15c. per yard.

A. For a license to lay it, yes.

x-Q. 76. That doesn't include the furnishing of anything?

A. No, none whatever.

x-Q. 77. You stated that since the organization of your corporation you had laid approximately three million yards of pavement. Does that include foundation as well?

A. Yes, sir.

x-Q. 78. About what proportion would you say was pavement and what is foundation of that?

A. Eighty to ninety per cent. would be pavement.

x-Q. 79. I would ask you if it is not a fact that the Hassam pavement is more inclined to be dusty and dirty than either the Warren bitulithic pavement or the Barber asphalt?

A. In my opinion when it is first laid it is. After the cement dust which wears off the top has had traffic for approximately a year, or enough to wear that off, it is not as dusty as either one of them.

x-Q. 80. I would ask you whether or not it isn't more apt to wear out automobile tires than almost any other kind of pavement?

A. No sir, I think not.

x-Q. 81. What is the distinction or difference between what has been here designated as patents Nos. 1 and 2. What is contained in the second patent that is not in the first?

A. The second patent gives a right to lay the pavement in one or more courses, that is the substantial difference.

x-Q. 82. Could you not have laid it in one or more courses under the first patent?

A. Possibly.

x-Q. 83. And what improvement, if any, is added by what is here designated as the third patent, over the second?

A. By the combination of the grouting and agitating by rolling during the construction of the grouting, and by putting on one or more layers of pea stone on the top until it is a perfect grade as desired.

x-Q. 84. You provided for rolling in your first patent, did you not?

A. Yes, sir.

x-Q. 85. Then all the difference between the second and third patents would be the addition of the pea stone, would it not?

A. No, I do not think so. I think there is a difference there. I haven't looked at these patents for so long I do not recollect the differences that are in them. I should have to study them for a few minutes in order to answer that question. Patent No. 1 does not allow for grouting and agitating the mass to expel the air and fill the voids of the stone with said grout and repeating the process of laying the mixture of stone and grout and agitating the same until the desired thickness is reached.

x-Q. 86. That you claim, however, was remedied by patent No. 2?

A. Yes, sir.

x-Q. 87. Now the question is, what improvement did you make, if any, by patent No. 3?

A. As I remember this, our patents Nos. 1 and 2 are the process of constructing a road or pavement

which consists in laying a layer of uncoated stones. In patent No. 3 it comprises a foundation or layer of hard rolled stone; I do not know but what it might be coated.

x-Q. 88. Is it?

A. Not necessarily.

x-Q. 89. You have a fourth patent, have you not?

A. I think I have several of them; I think I have seven or eight of them.

x-Q. 90. And that provides, does it not, for a layer of grouted stone?

Objected to by Complainants' Counsel as immaterial, as that is not in suit.

A. I have not looked at them for so long I would have to study them.

x-Q. 91. Now the Warren Company also use the pea stone, do they not, and have for many years, as top surface?

A. Yes, sir.

x-Q. 92. They are not licensees of yours for that purpose?

A. They are not.

The desposition of the witness having been read to him, the signature is waived by counsel.

HAROLD PARKER, being called as a witness on behalf of the Complainants, and being first duly sworn, deposes and testifies as follows:

DIRECT-EXAMINATION BY MR. SOUTHGATE:

Q. 1. What is your name, age, residence and occupation?

A. Harold Parker, residence Lancaster, age fifty-seven, civil engineer.

Q. 2. What experience have you had in connection with road construction?

A. I have had about twenty-eight years' experience in building roads. As civil engineer I built a good many roads in my early experience, and for twelve years was a member of the Massachusetts Highway Commission in building all of the state highways in the State of Massachusetts, and very many of the towns and city roads and streets in the State. My observation of roads and construction has taken me into nearly every part of the United States and many foreign countries.

Q. 3. Are you familiar with the so-called Hassam road or Hassam pavement?

A. Yes.

Q. 4. Will you please state what you have observed concerning the advantages of construction and the durability of such roads as you have seen and observed, constructed under the so-called Hassam process, and please answer the question generally and comparing the same with other methods of construction of roads with which you are familiar.

Objected to by Defendants' Counsel as incompetent and immaterial.

A. My observations of the so-called Hassam method of making a permanent road are based upon the following facts and technical considerations:

Firstly, I consider that the modern method of building a road to resist both the ordinary horse-drawn

traffic and the action of automobiles requires a road or pavement to be so constructed that it will successfully resist both the conditions. A concrete properly constructed is in my opinion the only really permanent pavement to be used in roads where traffic is heavy, and in order to make it effective it must be built in a method different from that employed in ordinary concrete construction. The reason that I hold this view is that from the nature of things a concrete mixed either by hand or by machine, in the very act of handling, must, owing to the different specific gravity of its ingredients, be more or less separated into its component parts and that, therefore, ordinary concrete hauled out and dumped onto the road is actually separated by the act itself and therefore cannot be uniform in its structure.

Further, the stone composition or concrete placed on the road and tamped with an ordinary hand-tamper is not, and never can be, uniformly solid in its structure, and many weak places necessarily develop because of the different commingling of the ingredients. This results in an uneven surface and the destruction of the road more or less rapid, according to the skill of the persons laying the concrete.

Furthermore, it is impossible to lay concrete in the ordinary way, in thin layers on a road, and get the surface smooth and satisfactory.

On the other hand, the method employed under the Hassam process overcomes all of these difficulties in the following manner:

The broken stone is first placed upon the roadbed, properly prepared and of actually measured cross-section, and rolled on with a heavy roller so that the stone composing the road is as nearly thoroughly locked together as it is possible to get them without a binder, and its air spaces between the stones are reduced to a minimum. Stones so laid can be brought to a perfect cross-section. When this is done, a mixture of cement and sand and water or grout is distributed evenly over the entire mass until it flushes to the surface, and while it is yet green is rolled once more, thus eliminating any air spaces in the structure, and the result is a practical monolith of uniform density and structure and of perfect cross-section.

In order to secure the most effective results, a sealing or final coat of rich grout is distributed evenly over the surface as a wearing surface, and on this is spread a thin layer of stone chips sufficient in quantity to absorb the grout. This produces a wearing surface which is neither too smooth and which protects the road itself.

My experience resulting from long observation and trial is that a pavement made properly in this way is the only form of concrete structure which will stand the wear and tear of traffic.

CROSS-EXAMINATION BY MR. HALL, DEFENDANTS'
COUNSEL:

x-Q. 5. What relation, if any, have you to the Complainant, Hassam Paving Company?

A. I am one of its Directors and also its executive officer; that is, first vice-president with the general charge of the work outside of the construction.

x-Q. 6. You are a stockholder in the corporation?

A. I don't think at the present moment I own a share of stock.

x-Q. 7. Are you a stockholder in the Oregon Has-sam Company?

A. No, sir.

x-Q. 8. But you are in the employ of the corporation?

A. Yes, sir.

x-Q. And have been for how long?

A. I think I became an officer of this company the first of October last year.

x-Q. 10. What class of roads have you been constructing in the past twenty-eight years, Mr. Parker?

A. I have built dirt roads, gravel roads, macadam roads, concrete roads, bitumen roads of every known character, and paving, brick and stone.

x-Q. 11. What was your process of building concrete roads, just briefly?

A. I did not build very many concrete roads until I came into this company, but what I have done were in the old-fashioned line.

x-Q. 12. That is, you mean by mixing the concrete on the ground and tamping it or rolling it?

A. I mean the ordinary method of laying concrete, which is to mix by hand or machinery and tamp it also by hand.

x-Q. 13. Would it not be practical to mix on the

ground by having a sufficient force of men for that purpose, and to follow up immediately with a heavy roller and roll the concrete instead of tamping it by hand?

A. My judgment is, and that is based upon observation, that hand-mixed concrete placed upon the road and rolled with a roller is absolutely unsatisfactory.

x-Q. 14. Would it be any better if it were machine mixed and then rolled with a heavy roller?

A. No, sir.

x-Q. 15. The grout used by the Hassam people in the construction of their pavement is not always mixed on the ground, is it, or by that I mean at the spot where the street is being constructed?

A. So far as I know, it is. Theoretically, it should be.

x-Q. 16. Are you familiar with the construction of what is known as the Warren bitulithic pavement?

A. Yes.

x-Q. 17. How long have you been familiar with that mode of constructing pavement?

A. I think I saw the first Warren bitulithic pavement laid.

x-Q. 18. When and where was that?

A. It was in the City of Boston. I should be at a loss to tell you how long ago, but it was when they first got their patents out.

x-Q. 19. Prior to 1900?

A. It was somewhere about 1900. It may have been a year before or the year after, but within a short time of that date.

x-Q. 20. In laying Warren pavement the street is sub-graded and usually rolled, is it not?

A. You get a firm sub-grade.

x-Q. 21. Then uncoated crushed rock of about two inches in diameter is laid down to about five or six inches in thickness, is it not?

A. I have never seen that method carried out by the Warren Brothers.

x-Q. 22. You have never seen them lay crushed rock as a base?

A. And then put the tar on it?

x-Q. 23. After rolling it.

A. I have never seen it done by the Warren Brothers.

x-Q. 24. Have you seen roads, prior to say 1905, the base of which was constructed in the manner in which I have described?

A. Yes, sir.

x-Q. 25. You say you have constructed them yourself?

A. Yes, lots of them.

x-Q. 26. And after the rock was applied it was then rolled in order to reduce the voids to a minimum, was it not?

A. Yes.

x-Q. 27. Now, after the road had been constructed practically as far as I have described the process, have you ever known or seen the application of a binder of tar or other bituminous material applied?

A. On the surface of a road so built? Yes.

x-Q. 28. And after such binder was applied, have

you seen it rolled in order to bind it or to drive the binder into the remaining voids of the rock?

A. Yes, by the additional application of some other substance to prevent the tar or other bituminous binder from adhering to the roller. But you have got, in my experience, to put something with your tar or oil, which ever you are using, which will fill up and prevent its being too plastic.

x-Q. 29. In constructing a macadam road, if it is constructed of crushed rock, you roll that, do you not?

A. Yes, sir.

x-Q. 30. And also apply some kind of a binder?

A. Yes, sir.

x-Q. 31. What kind of a binder do you usually apply?

A. In the properly so-called macadam, generally stone dust of the same material as the stone is used in the binder with the addition of water. Sand may be used.

x-Q. 32. Or clay may be used?

A. It may be, but it will spoil your road.

x-Q. 33. After you apply the binder on macadam roads it then should be thoroughly rolled, should it not?

A. Yes.

x-Q. 34. To force the binder into the voids?

A. The binder is carried into the interstices between the stones by the action of water as well as the process of rolling.

x-Q. 35. The mixing of sand and cement in parts of 1 to 1, 1 to 2, 1 to 3, and 1 to 4 are not new, are they?

A. No, sir, that is, sand and cement?

x-Q. 36. Sand and cement.

A. No.

REDIRECT-EXAMINATION BY MR. SOUTHGATE:

Rd.-Q. 37. You were chairman of the Massachusetts Highway Commission several years before you resigned that position?

A. Yes, sir.

Rd.-Q. 38. Did the superiority of the Hassam pavement to which you have testified, have anything to do with your resigning this position and entering the employ of the Complainants, and if so please state.

Objected to by Defendants' Counsel as irrelevant and immaterial.

A. I should say yes, that I should not have joined the Hassam Paving Company as its officer unless I had been satisfied with the superiority of the product.

Signature of witness waived by counsel.

Adjourned until to-morrow, same place, at
10:30 A. M.

WORCESTER, Mass., June 7, 1912.

Met pursuant to adjournment.

Present: Counsel as before.

ARTHUR S. BROWNE, being called as a witness on behalf of Complainants, and being first duly sworn, deposes and testifies as follows:

DIRECT-EXAMINATION BY MR. SOUTHGATE, COMPLAINANTS' COUNSEL:

Q. 1. What is your name, age, residence and occupation?

A. Arthur S. Browne, fifty-one, Washington, D. C. Patent solicitor and expert.

Q. 2. Please state your qualifications and experience as patent expert.

A. I was graduated from Dartmouth College in 1881 and the following year I entered my present profession in which I have since been actively and continuously engaged. I have prepared and prosecuted many hundreds of applications for patents and I have made numerous investigations for the purpose of giving opinions concerning the novelty of inventions and the scope, validity and infringements of patents. I have testified as an expert witness in about three hundred and fifty patent suits in the United States Courts.

I have frequently visited work-shops and factories for practical experience.

I have heretofore testified in patent suits relating to street pavements.

I am retained by the Barber Asphalt Paving Company in patent litigation, and also by the Hassam Paving Company.

Q. 3. Have you examined, and do you understand, the inventions or improvements shown, described and claimed in the three Hassam patents in suit?

A. Yes.

Q. 4. Please state what you understand to be the inventions or improvements of these three patents; particularly claim one of the first Hassam patent, No. 819,652; claim two of the second Hassam patent, No. 851,625; and all four claims of the third Hassam patent, No. 861,650.

A. The first Hassam patent, No. 819,652, is for certain new and useful "Improvements in Pavements and Processes of Laying the Same", and at the outset the invention says:

"My invention relates to the making of stone or gravel roads or pavements, and it consists of an improvement in the method of making such roads or pavements, as hereinafter described, and particularly pointed out in the claims.

The object of my invention is to construct a cheaper, more durable, and for many purposes a more efficient road than has hitherto been constructed of broken stone or mixed stone and bituminous or other cement." (Page 1, lines 13-23.)

The specification then goes on to refer to certain prior pavements and disadvantages thereof and then describes the pavement foundation as follows:

"No bituminous material is used in my method of construction of road, but only broken

stone or gravel, sand, and cement. The street is first dug out to the proper depth for the subgrade, which is rolled, if needed. Broken stone or gravel is then spread to a proper depth and rolled with a steam-roller or compressed by any suitable means until the voids between the stone are small and the surface even. It will be noted that as there is no coating of cement, bituminous, or other material on the pieces of stone they can be compressed very close together and solid, and the voids left between them will be extremely small. When the stone or gravel has been compressed to the desired closeness and firmness, it is grouted with a mixture of cement, sand, and water, which may not be prepared until immediately before it is to be used and which does not require excessive handling, like the mixture for concrete, and therefore does not suffer from being handled by careless workmen. All the voids are filled with cement in the grouting operating." (Page 1, lines 56-80.)

In accordance with this described mode of operation, it will be noted, (1) that uncoated broken stone or gravel is employed for the foundation; (2) that this uncoated broken stone is spread to the proper depth and is then rolled with a steam roller, or otherwise compressed until the voids or vacancies between the stones are made very small; and (3) after the stone has thus been compressed, it is grouted with a mixture of cement, sand and water which flows into the small voids or vacancies between the broken stone so that they are filled with the cement.

The specification then goes on to describe the appli-

cation of a suitable surface to the foundation. It states that after the cement has stood and grown hard and a solid foundation has been obtained, brick, stone or wood block may be added for the surface. It states, however, that it is preferred to make the surface by means of a thicker grout of cement, sand and water and fine broken stone or gravel, the stone or gravel being rolled into the grout when it is still green.

The road or pavement which is thus prepared is defined in claim one of this first Hassam patent as follows:

“1. A road or pavement consisting of a bottom layer of hard-rolled uncoated stone, a grouting of cement placed upon said stone and filling all the voids therein, and a suitable surface placed on said grout.”

It will be noted that this claim specifies the particular characteristic of the foundation, including the hard rolled uncoated stone, and the grouting filling the voids; and that it broadly recites the wearing surface, defining it simply as “a suitable surface placed on said grout.”

In other words, the “suitable surface” of the claim may be any of the surfaces such as are specifically referred to in the specification, namely of brick, stone or wood block, or of the fine stone or gravel mixed with a grout of cement, sand and water. The claim is directed to the specific foundation combined with a suitable wearing surface.

The second Hassam patent, No. 851,625, is directed to a particular improvement upon the road of the first

Hassam patent, No. 819,652. At the outset the specification of the second Hassam patent says:

“My invention relates to a process of constructing stone or gravel roads or pavements and it is designed particularly as an improvement on my previous invention, patented May 1, 1906, No. 819,652.” (Page 1, lines 12-16.)

The specification then goes on to say that difficulty had been encountered in distributing the grout in such manner that it will run into and fill all the voids or spaces in the stone layer. Accordingly, the particular object of the invention of the second Hassam patent is, in its own language, “to lay the pavement, and particularly the grout, in such a manner that all the voids in the stone layer will be filled therewith and no holes will be left in the surface.” (Page 1, lines 36-40.)

This is accomplished by agitating the grout as it is placed upon the stone and after being placed upon the stone so that the air holes are closed up, and the voids are filled with the grout. As stated in the specification, for the purpose of properly agitating the grout a steam roller is preferably employed, which may be the same as used for compressing the stone.

This agitating the mass of stone to expel the air and fill the voids with the grout is the distinguishing improvement as compared with the first Hassam patent and this is made evident by the language of claim two of the second Hassam patent, which reads:

“2. The process of constructing a road or pavement which consists in laying a layer of uncoated stone, compressing said stone layer

until the voids are small, grouting with a mixture of cement, sand and water, agitating the mass to expel the air and fill the voids between the stone with said grout, and placing a surface on the mass thus formed.”

In other words, the layer of broken uncoated stone is prepared as in the first Hassam patent and is grouted with a mixture of cement, sand and water, as in the first Hassam patent, and a wearing surface is applied as in the first Hassam patent; but the distinguishing characteristic is that the mass is agitated as by rolling during the application of the grout so as to insure expelling the air and filling all the voids between the stone with grout.

The third Hassam patent, No. 861,651, was co-pending in the Patent Office with the second Hassam patent, and its distinguishing feature consists in the way in which the wearing surface layer is applied to unite with the grout foundation. After referring to the first Hassam patent by number and date, I note the specification of the third Hassam patent reads:

“The principal object of this invention is to provide for improving the surface layer, and the improved surface layer can be used either with those constructions and methods which involve the use of previously coated stone, or with that which is carried out with uncoated stone afterwards grouted.” (Page 1, lines 20-25.)

The specification then describes the laying of the broken stone foundation and the application of the

grout thereto in substantially the same way as in the second Hassam patent, so that the voids are all filled with the grout; but with this difference, that the grouting is one which fills the voids and overflows the foundation.

In accordance with the first Hassam patent the cement used in the grouting operation is allowed to stand until perfectly hard before the wearing surface is applied. In accordance with the third Hassam patent the wearing surface is applied while the grout is still fluid and before the cement has a chance to set or harden, so that the wearing surface material is united to the foundation by the grout. In this connection the specification of the third Hassam patent says:

“In order to produce a suitable surface on top of the pavement or other structure which is being made, uncoated fine or pea stones are rolled into the layer *c* before the cement has a chance to set or harden. The top layer *c*, however, may be formed of a mixture of sand, cement and fine pea stones, preferably in substantially equal proportions, and a suitable amount of water, and applied to the top of the layer of hard rolled stones.” (Lines 53-61.)

There are four claims in the third Hassam patent.

In accordance with claim 1, the hard rolled stone of the foundation need not be uncoated in accordance with the statement made in lines 42-45 of the specification, and the surface layer of fine stones is embedded in the continuation of the grouting which fills the voids between the foundation stones,

Claim 2 requires that the foundation layer shall be composed of uncoated stone, and it specifically requires that the top layer of smaller uncoated stones shall be compressed into the surface of the foundation grouting before it sets.

In accordance with claim 3 the foundation stones need not be uncoated, and the top layer is compressed into the surface of the foundation grouting before it sets.

Claims 1, 2 and 3 are directed to the structure or pavement itself. Claim 4 is directed to the method of making the pavement; and in accordance with this method the uncoated foundation stone is first rolled, then a thin grouting is placed thereon which runs down and fills the voids in the foundation stones, and finally fine uncoated stones are compressed into the grouting before it sets.

Q. 4. Have you read, and do you understand, the process of making a roadway and the roadway itself described commencing line 19, page 24, to and including line 19, page 26 of Defendants' answer in this case?

A. Yes.

Q. 5. Please compare the process of making a roadway and the roadway itself described in the said part of Defendants' answer, to which your attention was called in the previous question, with the three Hassam patents in suit and state whether or not you find that the same are substantial embodiments of any of the claims of said patents and if so, please particularize the claims and give reasons in full for your answer.

A. The portions of the answer to which my atten-

tion has been directed describe a pavement having the characteristics defined in claim 1 of the first Hassam patent and of claims 1, 2 and 3 of the third Hassam patent; and the process or method of making found in the answer is in accord with claim 2 of the second Hassam patent and claim 4 of the third Hassam patent.

For brevity, I will refer to the pavement and method as described in the portions of Defendants' answer to which my attention has been directed as "Defendants' Pavement" and "Defendants' Method".

The rock used for the foundation in Defendants' pavement is thus described in the answer—

"The rock for making the concrete shall be the best hard, dark-colored, sound basalt rock, or granite, or equally hard stone, not less than ninety per cent. broken in pieces not larger than two and one-half ($2\frac{1}{2}$) inches in the largest diameter, nor smaller than one and one-half ($1\frac{1}{2}$) inches in diameter.

"The broken rock shall be screened so that all dust, clay, loam, vegetable matter and pieces smaller than one-half ($\frac{1}{2}$) inch in diameter shall be removed. The rock shall be thoroughly washed if considered necessary by the City Engineer."

Accordingly, defendants employ a hard uncoated stone for the foundation.

Defendants then spread and roll the foundation stone in the following described manner :

"Upon the finished subgrade, clean, broken rock, ninety per cent. of amount varying in size from two and one-half ($2\frac{1}{2}$) inches to one and

one-half ($1\frac{1}{2}$) inches, shall be spread to a sufficient depth to bring the surface after rolling to the proper finished grade of the street, which shall be six (6) inches above subgrade.

“This rock shall be thoroughly compacted by rolling with a road roller, giving a compression of not less than 250 pounds per inch width of roller, and shall be firmly bedded and the voids reduced to a minimum, and surface shall conform to grade and contour of the street. Such portions of pavement as it may not be possible to roll shall be thoroughly compressed by tamping.”

Accordingly, as called for by the Hassam patents, the foundation layer of stones is rolled until the spaces or voids are reduced to a minimum and hence made small.

The defendants then place grout and agitate the mass by rolling or compressing, until all of the voids in the rock are thoroughly filled with the grout. In this connection the answer says:

“The voids in the rock shall then be thoroughly filled with a grout consisting of one part of Portland cement or two parts of sand. This grout shall be sufficiently thin to flow freely, and shall be thoroughly and continuously mixed and poured upon the rock until all the voids are filled and the grout flushes to the surface under the rolling or compression, which shall immediately follow the grouting and shall be continued until no further compacting results.”

The answer does not specifically state water is employed, but in view of the statement that the grout is

sufficiently thin to flow freely, the presence of water is necessarily inferred.

Accordingly, as is the case in the first Hassam patent, the voids in the stone are occupied by the grout; and in accordance with the second and third Hassam patents the mass is agitated by rolling as the grout is applied, thereby insuring the elimination of air from the voids, and the filling of the voids with the grout. Also, as called for by the third Hassam patent, enough of the grout is employed to flush to the surface and hence to supply a layer of grout above the foundation stone.

A wearing surface is then applied as thus described in the answer—

“Upon the surface of the pavement thus prepared, shall be placed a very thin layer of peastone, which shall be thoroughly spread and rolled or compressed evenly and smoothly over the entire surface. The peastone layer shall have just sufficient thickness to insure the complete filling of the voids in the pavement surface. Rolling shall continue until the grout flushes to the surface.

“After rolling, this surface shall, at the discretion of the City Engineer, be broomed until surplus water is removed and the surface presents a true and even appearance.”

Accordingly, a wearing or surface layer is applied as called for by the first and second Hassam patents; and this wearing surface layer consists of fine stones compressed into the surface of the grouting before it sets as in the third Hassam patent.

Defendants' pavement is, accordingly, that defined

in claim 1 of the first Hassam patent, and in claims 1, 2 and 3 of the third Hassam patent.

In accordance with claim 1 of the first Hassam patent, Defendants' pavement consists "of a hard-rolled, uncoated stone, a grouting of cement placed upon said stone and filling all the voids therein, and a suitable surface placed on said grout."

Likewise, in accordance with claim 1 of the third Hassam patent, Defendants' pavement is, "An artificial structure comprising a foundation layer of hard rolled stone having grouting filling the voids therein and a surface layer comprising a continuation of said grouting containing fine stones compressed into its surface."

Also, in accordance with claim 2 of the third Hassam patent, Defendants' pavement consists—"of a bottom layer of hard rolled uncoated stone, a grouting of cement placed upon said stone and filling all the voids therein, and a top layer of smaller uncoated stones compressed into the surface of said grouting before it sets."

Also, as called for by claim 3 of the third Hassam patent, Defendants' pavement consists of a "bottom layer of stone, a grouting placed upon said stone and filling all the voids therein, and a top layer of smaller uncoated stone compressed into the surface of said grouting before it sets."

Defendants' pavement is laid in accordance with the method or process defined in claim 2 of the second Hassam patent and in claim 4 of the third Hassam patent.

In accordance with claim 2 of the second Hassam

patent, Defendants' process of constructing a road or pavements "consists in laying a layer of uncoated stone, compressing said stone layer until the voids are small, grouting with a mixture of cement, sand and water, agitating the mass to expel the air and fill the voids between the stone with said grout, and placing a surface on the mass thus formed."

It will be noted that Defendants agitate the mass to expel the air and fill the voids with the grout by rolling just as the second Hassam patent states is preferable.

Likewise, Defendants' method is as defined in claim 4 of the third Hassam patent, namely, it is,—
"The method of making a pavement which consists in rolling uncoated stone, placing a thin grouting thereupon, allowing the grouting to run down and fill the voids in the layer of stones, and compressing fine uncoated stones into said grouting before it sets."

Noon Recess.

CROSS-EXAMINATION BY MR. HALL, DEFENDANTS'
COUNSEL:

x-Q. 6. Are you a practicing attorney, Mr. Browne?

A. I am a member of the bar but I do not practice.

x-Q. 7. Do you not practice in the Patent Department in Washington?

A. As a solicitor, yes.

x-Q. 8. You state that you are retained by the Hassam Company?

A. Yes.

x-Q. 9. In what capacity?

A. As a patent expert to testify in patent suits.

x-Q. 10. In any and all suits that they may have?

A. Yes.

x-Q. 11. As I understood your testimony upon direct examination, that the difference or distinction between patents numbered one and two is that in number two there is some difference in the method of agitating the rock and the grout. Is that correct?

A. Yes.

x-Q. 12. Patent No. 1 in paragraph three thereof, provides that after the layer of uncoated stone is laid and compressed, it is grouted with a mixture of cement, sand and water and then rolled; that is, it doesn't provide for rolling but by compressing it into the surface of said grout before it is set. Do you understand from the word "agitating," used in paragraph three of patent No. 2, that any other means of agitation is employed than rolling?

A. I do not understand that in accordance with the first patent there is any rolling or compression of the grout in forming the foundation. As I understand the first patent the grout is simply poured upon the foundation and flows into the voids between the stones by gravity. The first patent does provide that after the cement thus handled has been allowed to stand until perfectly hard, that the surface layer of fine, broken stone and a thicker grout is rolled and compressed.

In the second patent it is stated that a steam roller is preferably employed for compressing the stone. I infer that this may be done otherwise than by rolling.

x-Q. 13. Under the formula of patent No. 1 the

grout was to be compressed after being spread on the uncoated stone, was it not?

A. No, not the grout which enters into the voids between the uncoated stones. The grout used with the surface layer was to be compressed.

x-Q. 14. Would you say as an expert, from your examination of patents here designated as Nos. 1 and 2, that supposing that No. 1 had not been patented that a person could use the formula laid down in No. 2 without infringing upon No. 1?

A. No.

x-Q. 15. Then what value or new idea was added by No. 2?

A. The idea of rolling or otherwise agitating the mass at the time the grout was applied to the foundation layer of stone. As the second patent states, in the practice of the first patent, the grout does not expel all the air in the cavities or voids between the stones, and hence a solid foundation is not obtained.

In accordance with the second patent, owing to the rolling of the foundation at the time of the application of the grout, all of the air is expelled and the voids between the stones are filled with the grout. This makes a solid foundation.

x-Q. 16. As I understand from your direct testimony, the only changes in patents Nos. 1 and 2 worked by patent No. 3, is the manner in which the wearing surface is applied, that is being applied while the foundation is still green?

A. Yes, excepting that in accordance with some of the claims of patent No. 3, the foundation stone need not be uncoated.

x-Q. 17. There are no other differences?

A. No.

x-Q. 18. But if any person, after the issuance of patents Nos. 1 and 2, attempted to lay a pavement under No. 3, he would have been infringing upon Nos. 1 and 2, would he not?

A. Yes.

x-Q. 19. So, therefore, the additions or so-called improvements incorporated in No. 3 were not necessary to the patent, were they?

A. They were not necessary to patents Nos. 1 and 2. That is to say, patents Nos. 1 and 2 might be infringed without infringement of patent No. 3.

On the other hand, patent No. 3 involves an additional improvement of its own which could have been employed.

Therefore, a concern might be licensed under patents Nos. 1 and 2 and not under No. 3; and should such licensee then practice the process and make the pavement of patent No. 3 it would be an infringer of No. 3.

x-Q. 20. But in patent No. 1 or No. 2 there are no directions or formulæ that would preclude the rolling of the grout after being applied, if the builder thought proper to do so?

A. No.

Deposition closed.

Signature of witness waived.

IT IS STIPULATED between counsel that the exhibits offered in evidence may be kept in custody of counsel

and not returned by the Notary, subject to inspection at all reasonable times by opposing counsel.

Complainant rests its *prima facie* case.



IN THE

DISTRICT COURT OF THE UNITED STATES

FOR THE DISTRICT OF OREGON.

<p>HASSAM PAVING COMPANY, a corporation, and OREGON HASSAM PAVING COMPANY, a corporation,</p> <p style="text-align: center;">Complainants,</p> <p style="text-align: center;">vs.</p> <p>CONSOLIDATED CONTRACT COMPANY, a corporation, and PACIFIC COAST CASUALTY COMPANY, a corporation,</p> <p style="text-align: center;">Defendants.</p>	}
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NOTARY'S CERTIFICATE.

I, C. Forrest Wesson, a Notary Public in and for the Commonwealth of Massachusetts, do hereby certify that the foregoing depositions of WALTER E. HASSAM, HAROLD PARKER and ARTHUR S. BROWNE, all residing more than one hundred miles from the place of trial, were taken before me as Notary Public at the time and place stated in the record; that counsel

for both parties were present during the entire taking of the depositions; that the witnesses were first duly sworn by me to tell the whole truth, before testifying, with the exception of Harold Parker, who by agreement was sworn by Complainants' counsel; that the testimony was taken stenographically in writing by consent of counsel and read to the witnesses; that the signatures of the witnesses to their depositions were waived by counsel; that by agreement of counsel the exhibits offered in evidence were left in the custody of counsel for Complainants; and that I am not connected by blood or marriage to any party to this suit, nor interested directly or indirectly in the event thereof, nor am I attorney or of counsel for either party.

[SEAL]

C. FORREST WESSON,
Notary Public.

IN THE
DISTRICT COURT OF THE UNITED STATES
FOR THE DISTRICT OF OREGON.

In Equity.

HASSAM PAVING COMPANY, a corporation, and OREGON HASSAM PAVING COMPANY, a corporation,

Complainants,

vs.

CONSOLIDATED CONTRACT COMPANY, a corporation, and PACIFIC COAST CASUALTY COMPANY, a corporation,
Defendants.

Depositions
Taken at Portland,
Oregon.

PORTLAND, Oregon, November 12, 1912.

Parties met pursuant to adjournment and to the annexed stipulation for the taking of testimony at the office of John H. Hall and Jesse Stearns, Railway Exchange Building, Portland, Oregon, at 10 o'clock A. M. Present, Charles H. Carey, Esq., for complainants, and John H. Hall, Esq., and Jesse Stearns, Esq., counsel for defendants.

Thereupon the following proceedings were had, to wit:

GEORGE M. HYLAND, called as a witness on behalf of the defendants and after being duly sworn, testified and was examined as follows:

DIRECT-EXAMINATION BY MR. STEARNS:

Q. State your name, age, residence and occupation.

A. George M. Hyland, age forty-four years, residence 625 Halsey street, Portland, Oregon, occupation farmer.

Q. What was your occupation in 1909 and 1910?

A. I had charge of the promotion of the Oregon Hassam Paving Company, promotion department.

Q. By that, do you mean securing the work?

A. Yes, securing contracts.

Q. How long have you been connected with the Hassam Company in that capacity?

A. Two years.

Q. State whether or not you had anything to do with the incorporation of the specifications for Hassam pavement in the ordinances adopted by the council of the City of Portland on the 27th day of April, 1910, being Ordinance No. 21172, entitled "An ordinance in relation to the improvement of streets, and declaring an emergency".

A. Was that the general ordinance covering paving of streets?

Q. Yes.

A. I asked the engineer to incorporate our specifications with the rest, with the other paving companies and specify the name "Hassam."

Q. Did you furnish a copy of your specifications as incorporated in said ordinance to the City Engineer?

A. Yes, I furnished him a copy of the specifications at two different times.

Q. What did you say to the engineer at that time as near as you can recollect?

Objected to by counsel for complainants as calling for conversations between persons not parties to the suit.

A. I requested him to include the Hassam specification on the promise that we would furnish the city the same protection as other paving companies; that our people were established in this community now and that we were entitled to the same considerations others received. That is the substance of the conversations I had, as nearly as I can remember at this time.

Q. Previous to the adoption of this ordinance had the Hassam pavement been recommended as standard pavement in the city of Portland?

A. Not by the council or the city authorities. They had declined to pass an ordinance authorizing it and we had been obliged to depend on each individual ordinance for the work.

Q. Had Hassam pavement been laid on the streets of Portland prior to that time?

A. Yes, a small amount of it had been, in certain streets.

Q. What did you do to get the pavement adopted in certain streets prior to the adoption of this ordinance?

A. It was necessary to circulate a petition and get signers, often bringing a number of property owners before the council to urge the passage of the ordinance authorizing it.

Q. That took place in each instance?

A. In each instance. We always brought the property owners there and the question was always raised that there was no ordinance authorizing the Hassam pavement.

Q. Who was the city engineer at the time this ordinance was prepared?

A. J. W. Morris.

Q. How long since the first Hassam pavement was laid in the City of Portland, if you know?

A. About five years this winter.

Q. Where was that?

A. There were two sections put down about the same time, and I cannot tell you which took precedence. There were three blocks on Hancock street between East 21st and 24th streets, and there were seven blocks laid in Holladay's addition between 15th and 18th and Clackamas and Multnomah, or 16th and 17th and Clackamas and Multnomah; there were seven blocks there.

Q. Do you recall when the Hassam pavement was laid on Grand avenue between Belmont and Hawthorne?

A. That was put there in the summer of 1909, or 1908. I am not sure. I think it was 1909.

Q. Do you remember who laid this first pavement in Holladay's addition?

A. Miller and Bauer.

Q. Who laid the pavement on Grand avenue?

A. The same company, the Oregon Hassam Company, which was the company that had been organized at that time.

Q. The pavement on Grand avenue was laid by the company known as the Oregon Hassam Paving Company?

A. Yes.

Q. Have you been over that pavement frequently on Grand avenue?

A. Yes.

Q. Recently?

A. Yes, but not to notice it particularly.

Q. Can you state whether or not there have been any repairs made in that pavement on Grand avenue between Belmont and Hawthorne avenue?

A. Yes, quite extensive repairs have been made. I am not familiar with the details of the repair work, but we have discussed it and talked about and been over it.

GEORGE M. HYLAND.

(There was no cross-examination of this witness.)

GEORGE W. GORDON, called as a witness on behalf of defendants, and after being duly sworn, testified as follows:

DIRECT-EXAMINATION BY MR. JESSE STEARNS:

Q. State your name, age, residence and occupation?

A. George W. Gordon, age, sixty-three on the 7th of this month, residence 716 Corbett street, Portland, Oregon.

Q. How long have you resided in Portland, Oregon?

A. About twenty-two years.

Q. Where were you born?

A. Liverpool, England.

Q. At what age did you leave Liverpool?

A. I was about 24 to 25.

Q. What was your occupation in Liverpool?

A. I was apprenticed as a carpenter and builder.

Q. Did you know anything about the pavements in Liverpool before you left there, did you help lay any or have anything to do with that kind of work?

A. I have never had any of that work to do on contracts or anything of that kind; my work was always building construction, but I have seen it laid and know how it was done.

Q. What kind of pavements did you see constructed while in Liverpool?

A. Paving stone, hard surfaced pavements, concrete pavements, as we called them there, and what they called bitulithic pavement, we used to call them pitch pavements there.

Q. Will you describe what you saw and what you now designate as concrete pavement construction according to your observation?

A. Concrete pavements?

Q. Will you describe what you term concrete pavements according to your observation, what you saw at that time?

A. There the rock was mixed by hand usually then and we put the mixture down on the streets and rolled it, or tamped it where we could not roll it; we used to get it graded of course, and then laid the foundation with the cracked rock or stone, and then put the cement on top of it, very much the same as they do it here.

Q. Are you familiar with the so-called Hassam pavement here?

A. Yes, I have seen it laid frequently.

Q. Will you state whether or not any of the pavement you saw laid there was at all similar to the so-called Hassam pavement laid here, and describe it if so?

A. The only difference between the Hassam pavement and the pavement that I have helped to lay in my boss's yards in Liverpool; he had large yards there; we used to break the rock up with hammers; we would take all the refuse from the buildings and break it up with the hammer and pour cement and sand into that in the same manner the Hassam Paving Company do their work, with this exception: We had to put the cement and sand into the rock before rolling and roll it afterwards, that gave the cement a chance to get all around the rock. The way they do Hassam here, they lay the rock down without wetting it and then they take a roller and compact it by rolling until it loses about one-third of its volume, and then when you come to pour on the sand and cement it does not cover the entire rock, it is not distributed evenly. They would not let us do it that way in the old country.

Q. Was that sand, cement and water a fluid mixture?

A. Yes.

Q. That was poured over the rock?

A. Yes, and we used to take a little hand-roller and four boys would get hold of it and roll it back and forth until it was well rolled and compacted.

Q. In that kind of pavement were the voids or interstices filled with grout?

A. Yes.

Q. And rolled down afterwards?

A. Yes.

Q. That was forty years ago?

A. Yes, and that was done before my time, according to the old methods, the engineers used grouting methods long before my time. You can find that right in history where they mixed the stuff and put it on in very much the same way. It is an old, old method, this grouting, and can be found way back in the history of the Roman Empire; it was used then. Government engineers have used it for years in their construction work. There is nothing new about grouting.

Q. The substance of your statement is that the difference between the method used in the construction of Hassam pavement in Portland and the method used in Liverpool when you were there, that you have referred to, there in Liverpool the rolling was done after the grouting had been poured on, and here in the Hassam the stone is rolled before the grout is poured on?

A. Yes.

CROSS-EXAMINATION BY MR. CHARLES H. CAREY:

Q. You are a carpenter?

A. Yes.

Q. And you served apprenticeship as a carpenter in Liverpool, England?

A. Yes.

Q. How long were you an apprentice?

A. Seven years.

Q. At what age did you begin?

A. Fourteen years.

Q. And then you became a journeyman carpenter?

A. Yes, at 21 years of age.

Q. What was the name of your master?

A. James Ainsworth, Bortle, Liverpool, England.

It was a large place on the outskirts. He had a large estate.

Q. How long did you work as journeyman carpenter before you left Liverpool?

A. I left there when I was about 24 years old.

Q. Then you served there as journeyman carpenter for three years before you left?

A. I served three years after my apprenticeship in Liverpool.

Q. Were you contracting for concrete work in Liverpool?

A. No, I never did contracting then.

Q. The experience you have spoken of in your direct-examination in Liverpool was while you were an apprentice working for Mr. Ainsworth?

A. While I was an apprentice and afterwards. I was there about ten years working.

Q. Where was the paving in Mr. Ainsworth's premises that you spoke of assisting to make?

A. Not only on his premises but other places.

Q. I am speaking about this particular piece?

A. It was at Bortle, on the property of Mr. Ainsworth.

Q. Where was this particular piece?

A. There were several pieces around the yard, and work done around the docks in Liverpool also.

Q. The pavement you spoke of on his premises were in the yards?

A. Yes, sir.

Q. How extensive an area was that?

A. Probably 1,000 feet up in front of his house.

Q. How wide was it?

A. Eight to ten feet wide.

Q. Was this all done in one job?

A. No, there were several places. We put down a good deal of sidewalk and basements and so on.

Q. What you did there was to put down some concrete or hard surface walks in front of his premises?

A. Yes.

Q. And also some in the basements of the buildings?

A. Yes.

Q. You do that every day as contractor in Portland, do you not—it is customary everywhere, is it not?

A. To do what?

Q. Used grout for such purposes?

A. Sometimes yes and sometimes no.

Q. In Liverpool you never laid any such pavement as you described except as you were working for Mr. Ainsworth?

A. No, that is all I did there. It is laid there just the same, I can describe the way it is laid and tell you where. All the Liverpool docks where these big grain ships are unloaded from this country are constructed in the same way.

Q. You never did any of it yourself?

A. No.

Q. I am asking about your own experience, will you please answer my questions?

A. You asked me if there were any other places besides Mr. Ainsworth's place, is what I understood you.

Q. I asked you whether you had ever laid any of this kind of pavement yourself except as you worked for Mr. Ainsworth?

A. No, sir, I was not in the contracting business there.

Q. You were a carpenter?

A. Yes.

Q. Were you a concrete worker?

A. No, but the apprentice boys had to do that.

Q. After you became a journeyman carpenter yourself you didn't have to do it?

A. No, sir.

Q. Was all your experience in connection with this pavement in Liverpool obtained while you were an apprentice working for Mr. Ainsworth some 40 odd years ago?

A. Yes.

Q. You have appeared on various occasions as a witness against the Oregon Hassam Paving Company, have you not?

A. Once only.

Q. You have taken quite an active interest against them in this connection?

A. Against the paving company?

Q. Yes.

A. I have, yes.

Q. You have appeared in the newspapers against them, have you not?

A. Yes.

Q. And have been an enemy of the persons concerned in that company since they first began business here, have you not?

A. I am an enemy to nobody, no, sir. When I have appeared I have simply told the facts as they exist.

Q. You are not a paving contractor yourself, are you?

A. No, sir.

Q. You never have laid a foot of pavement in the public streets of Portland under contract with the city, have you?

A. No, sir.

Q. How long have you lived in Portland?

A. Twenty-two to twenty-three years.

Q. What has been your business during that time?

A. Contractor and builder.

Q. The erection of buildings?

A. Yes, sir.

Q. And have never been a contractor for street work?

A. No.

Q. So that your knowledge of the method of laying pavements in public streets is wholly what you have gained as a carpenter and builder and using concrete in and about structures that you have erected?

A. I have seen streets put down and have been

working constantly alongside of streets which were being put down and know just how they are put down. I observe these things, watch them all the time and that is where I gain my knowledge.

Q. Where do you live?

A. 716 Corbett street.

Q. What kind of pavement is laid in front of your premises?

A. Bitulithic pavement.

Q. No Hassam pavement laid in front of your premises?

A. No, sir.

REDIRECT-EXAMINATION BY MR. STEARNS:

Q. You started to tell something about pavements laid along the Liverpool docks?

A. Yes.

Q. Will you state what you started to say?

A. All the docks there where they unload grain from large vessels have that same pavement I am talking about right now, and it is grouted and rolled just exactly the same way our pavements are made here, which they call Hassam pavements, and that has been done for 40 years or more, and you can read about it in ancient history.

Q. Do you say that as a result of your own observation?

A. Not the ancient history part, but I worked for the Cunard company for about a year before I left there.

Q. Did you see that kind of pavement laid at that time?

A. There was none laid while I was there, but that pavement had been laid for years. They used to unload the grain from the vessels right onto that floor; we used to see them brush it up and clean it and they would put the grain right onto that floor.

Q. Will you state whether you have personally observed pavements and roadways being laid in the same manner as you have described for basements and walks around Mr. Ainsworth's place in Liverpool?

A. The same process exactly was used, the same principle, and grouting was used. I don't know of any difference; of course there might have been some difference as to the proportions of sand or cement and the method mixing; we used to mix by hand, and we used to use hand rollers. But the streets were graded and the mixture was the same and they used to grout it in the same way.

Q. Do you mean you saw other people lay pavements in the vicinity of Mr. Ainsworth's place in that same manner?

A. The only ones I saw were those I helped to lay myself right there. I know they were laid around there and I have driven over them many times.

Q. The same kind of pavement?

A. Yes.

Q. You have been asked by counsel whether you have been hostile to the Hassam Paving Company?

A. Yes, sir. There is no reason for any hostility between myself and any paving company. They have a monopoly for laying pavement here and have cut out everybody else, and that is wrong. That is the only

reason I have for any hostility towards them or any one. Contracts for laying pavements in this city ought to be so anybody could bid on the work according to the specifications.

Q. Are you a property owner?

A. Yes.

Q. Own property in different parts of the city?

A. Yes.

Q. Do you build houses for yourself, to sell?

A. Yes.

Q. Are you a taxpayer?

A. Yes.

Q. Is that the reason why you take an interest in the cost of pavements?

A. Yes. There ought to be competition in every department of that kind of work, and the laying of pavements in this city ought to be open to all. What is called the bitulithic pavement to-day was patented in England in 1832 by Castel, and several streets in Liverpool were laid with it before I came away.

Q. Have you any hostility toward any individual member of the Hassam Paving Company?

A. Not the slightest, don't think I know any of them.

Q. What interest have you in paving matters?

A. Simply to see that the paving is open and free for all to bid on, so we can have competition and consequently less cost.

Q. Simply as a taxpayer?

A. Taxpayer and property owner.

RECROSS-EXAMINATION BY JUDGE CAREY:

Q. You fought the bitulithic pavement in front of your house, didn't you?

A. I did.

Q. And you contended that the bitulithic patents were invalid and that the method of laying bitulithic pavement had been known many years prior to the time those patents were issued?

A. I claimed they have no valid patents on pavements now. They have patented formulas for cement. They use these and specify them in the specifications made by the city engineer. If they use these formulas or a patented name nobody can bid on that work but the company owning that formula or name. Now it is a well-known fact that in a city with the resources claimed here that we should be able to obtain any kind of pavement in the market, but instead of that we are paying for patented formulas while they use the very same material in the same way that it has been used for years.

Q. You think bitulithic was patented in England as early as 1832?

A. Yes. The reason I fought the Corbett street improvement was because we didn't want the street done. Corbett street had been laid with a macadam roadway which had just been put in and the street was as smooth as this floor and in good condition, and there was no necessity for laying another pavement at that time. It had been bonded by most of the people for that improvement and the time had not expired when this new pavement question came up, and they

took up the old pavement and put down the bitulithic pavement when there was no necessity for doing it, and only five years of the bonding act had run and to add ten years to that at an increased price would make a 15-year indebtedness to these people, and that was the reason it was fought. We got 78 per cent. of the people to sign a remonstrance against that added cost.

Q. You have written several articles for the newspapers about these different pavements, have you not?

A. Yes.

Q. And have claimed these patents were void?

A. No, I didn't claim anything of the kind. I said they couldn't hold valid patents on any kind of pavements that are laid as these are laid. They could hold a patent on a formula for the cement, and that the contracts for these street improvements should be open for competition.

Q. You spoke about some concrete work used at the public docks around Liverpool?

A. Yes.

Q. You didn't see that work constructed, did you?

A. No.

Q. And don't know the method used in constructing it of your own knowledge?

A. No, but it was just the same as concrete is laid here.

Q. As far as you could say it looked about the same thing as you had been using yourself?

A. Only much stronger and better, more cement in it.

Q. When you were an apprentice working for Mr. Ainsworth and laid down pavement on his premises, you said something about using a roller, what kind of a roller was it?

A. A roller about two feet in diameter and three feet wide. Four boys would get hold of it and roll it back and forth.

Q. Hand roller?

A. Yes.

Q. Did you have any machines for mixing the ingredients used?

A. No, I don't think they had any then. I did not see any at that time; that was way back in early days, a long time ago.

Q. What you did there was all done by hand by you boys while you were working as an apprentice on the estate of Mr. Ainsworth?

A. Yes; we would break up the stone to the proper size and mix it with sand and water and cement and roll it after it was put onto the street.

Q. The entire job was done by you four boys under the superintendence of a foreman or supervisor?

A. Yes.

Q. That is the only pavement you ever laid in Liverpool?

A. Yes, that is the only pavement I ever laid.

Q. You say this same kind of concrete was used in Rome at an early period—did you see any of that concrete laid?

A. No, I am going by history. You can see it in the history.

Q. You were not there yourself?

A. No, but I can read history and see that it was the very same kind.

RE-REDIRECT-EXAMINATION BY MR. STEARNS:

Q. Counsel asked you about bitulithic pavement. Are you familiar with the laying of bitulithic pavement yourself as you have observed it?

A. Yes.

Q. What is the difference between the laying of Hassam and the bitulithic, leaving off the surface of the bitulithic?

A. None whatever.

Q. Will you describe briefly the process of laying these two pavements?

A. After the roadbed is prepared and brought to a certain grade or sub-grade, then they take crushed rock according to the specifications, of certain sizes, from 1½ inches to 3 inches, or larger, or smaller as the case may be—the rock is about the same size in both cases. Sometimes they use larger rock than the specifications call for and sometimes there are smaller sizes. They take that and lay it down to a depth of, I think the Hassam calls for six inches, according to the specifications, and the standard bitulithic calls for six inches after it is completed; first four inches and then two inches on the top as a dressing. Both bases before filling with cement, in the Hassam and the asphalt, is mixed with crushed rock and they are just the same as to the base. They roll them in both cases quite compactly. With the Hassam they have a kind of a mixer for mixing the sand and cement together, a machine. They pour it onto the rock until they fill

up all the interstices and spaces full to the surface and then that is rolled again, and they go over it or brush it after it is rolled. In the case of the bitulithic they have a mixture, sometimes gravel and sometimes crushed rock, practically the same material for the base as the other. They have a mixture of asphalt and while it is hot they put it on about two inches thick. They roll the base until it is supposed to be six inches deep after it is completed. Four-inch base and a two-inch top dressing and on top of that they put the asphalt mixture.

Q. Do you know whether there is any difference between the filling put on the two pavements?

A. Yes, there is. The bitulithic is similar to the cement grout except it is asphalt or bitumen or coal tar, and in the other case they use Portland cement. It is put on as a kind of a sticker, to cement or stick the crushed rock together.

GEORGE W. GORDON.

J. W. MORRIS, called as a witness on behalf of the defendants, after being duly sworn testified as follows:

DIRECT-EXAMINATION BY MR. JOHN H. HALL:

Q. State your age, residence and occupation.

A. Thirty-nine years of age, 1772 East Yamhill Street, Portland, Oregon, civil engineer.

Q. How long have you followed the profession of civil engineer?

A. Eighteen years.

Q. In what line of that profession?

A. I think every line of it. Railroading, municipal engineering and construction work.

Q. What official position have you occupied in the city of Portland?

A. City Engineer for two years from July 1st, 1909, to July 1st, 1911.

Q. Did you hold that position on and prior to the first day of April, 1910?

A. Yes, from July 1st, 1909.

Q. Do you recall an ordinance adopted by the City of Portland and by the city council and signed by the mayor No. 21,172, entitled "An ordinance in relation to the improvement of streets and declaring an emergency", which was an ordinance defining the manner and setting forth the specifications for the pavement of streets to be followed in the city of Portland?

A. Yes, I recall that ordinance.

Q. Who drew the ordinance?

A. I had considerable to do with it as it was drawn in my office under my supervision.

Q. Were you acquainted with any of the representatives of the Hassam Paving Company?

A. I was acquainted with their manager at that time. I don't recall any of the other members in the company now.

Q. Who was their manager at that time?

A. Mr. George M. Hyland.

Q. Do you recall whether or not in the course of the framing of that ordinance containing the specifications—did it contain the specifications of what was known as Hassam pavement?

A. Yes, it did.

Q. Do you know whether or not that was with the knowledge and consent of the manager of the Oregon Hassam Paving Company?

A. It was.

Q. Do you recall whether or not the manager of the Oregon Hassam Paving Company requested or solicited the incorporation in the ordinance described of the specifications of Hassam pavement?

A. I recollect that Mr. Hyland talked to me on that subject a number of times. It has been some time back but to the best of my memory Mr. Hyland represented to me that Hassam paving was on the streets of Portland, that it had been laid here and would be laid in the future, and as a business proposition he considered that the pavement should now be recognized in this ordinance that I was drawing up at that time.

Q. Were any objections ever made by any member of the Oregon Hassam Paving Company, or any other kindred corporation to that company, to such specifications being incorporated in that ordinance?

A. Not to my knowledge.

J. W. MORRIS.

ROBERT S. EDWARDS, called as a witness on behalf of the defendants and after being duly sworn testified as follows:

DIRECT-EXAMINATION BY MR. HALL:

Q. State your age, residence and occupation.

A. Age 35, residence Portland, Oregon, occupation consulting and chemical engineer.

Q. How long have you followed the business of consulting and chemical engineer?

A. Ten years.

Q. For whom have you been employed in that capacity?

A. After graduating at a technical school in Boston I was employed in a Lime-Cement Manufacturing Company, Rockland, in Maine for three years, and during that time I was State Assayer in the State of Maine, operating laboratories for testing material in Boston, under the name of Sherman & Edwards. In 1910 came to Portland, Oregon, to take charge of the inspection of materials for the Portland Railway Light and Power Company in their electrical construction work at Estacada, Clackamas county, in this state. I am now operating an independent testing laboratory for building and construction work and to test cement and concrete under the name of Edwards & Lazelle; I am also inspecting engineer for the Portland Railway, Light & Power Company.

Q. Have you ever made any study of grouting, a manner of mixing and using cement as a grout?

A. I have practically spent the best part of my life since graduating from the university in becoming expert in that work.

Q. I would ask you whether or not outside of the process used by the Hassam Paving Company you are familiar and have been with the process known as grouting?

A. Yes, I am very familiar with that process. In fact have given it considerable study and thought and

time in conjunction with the Portland Railway, Light & Power Company's new dam where I had the proposition come up of solidifying the foundation before we could build the dam. And after investigating the various methods for doing this and the various machines, we decided to use what is known as liquid cement grout forced in the rock under pressure as the only satisfactory existing method to employ to fill up the interstices or voids in the rock foundation.

Q. I will ask you to describe the process of grouting or mixing of the cement?

A. The process that we used, do you mean?

Q. Yes, the ordinary method used in grouting, if there are different methods please state what they are.

A. The only difference in the method is, sometimes they use a richer grout than other times. The process of manipulation is practically the same. The constituents used in grout are of course cement, sometimes they use it one to one, or one to two—one part sand to one part cement—or one part cement to two parts sand, according to the richness desired. The grout is generally mixed in a mixing machine to a consistency that will flow easily and then placed in tanks which are put under pressure and the grout forced from the tanks through tubes or pipes into the material or rock, or whatever it may be that is going to have its voids filled up or solidified. That is the general process used, and it has been used in several of the largest engineering works, and pieces of construction in the United States. For instance, the Brooklyn-New York subway—their steel cylinders were filled up with loose rock of dif-

ferent sizes, leaving an opening from the cylinders into the interior of the tube and after the steel cylinders were placed they attached these pipes or hose which were connected with the power grouting machines and the grout was forced into the rock until it filled up the voids. The Catskill aqueduct work used practically the same identically process, and several large engineering operations abroad have used it and it has become very common now.

Q. How long has that process been known to engineers?

A. The process probably has been known for at least eight to ten years, probably much longer, but within the eight to ten years it has been used very commonly in engineering work.

Q. In the construction of a street or roadway where it becomes necessary to fill the voids with cement, a pavement that has a rock foundation, would you say it required any amount of skill or technical knowledge to pour the grout on the rock and force it into the voids by pressure from a roller?

A. I would say that was the simplest form that is known in the application of grouting.

CROSS-EXAMINATION BY JUDGE CAREY:

Q. What was the first example that you knew of the use of that method you have described?

A. To my knowledge?

Q. The first one known to you?

A. From investigations and works that I have looked up on engineering projects, I think the first example

that came to my attention was a dam in the Arkansas river.

Q. When was that constructed?

A. About 1906-1907.

Q. At what place in that river was that dam?

A. I would have to look that up to tell you definitely. I could find it for you.

Q. Your experience up to the time you worked for the Portland Railway, Light & Power Company on its dam on the Clackamas river was that of a chemist rather than of a constructing engineer, was it not?

A. I am a chemical engineer.

Q. What I mean is, your work was largely laboratory work and not construction work up to that time?

A. No, my work from 1904 until I came out here was a combination of construction work and testing of materials.

Q. What jobs did you ever have charge of as construction engineer prior to the time you came to Oregon?

A. I built three lime manufacturing plants prior to coming to Portland, Oregon.

Q. Where were they?

A. One in California—Davenport near Santa Cruz. The second at Round Rock, Texas, and the third at Harper's Ferry, West Virginia.

Q. Any other construction work you had charge of?

A. No, no particular construction work. I was inspector on municipal work at Boston, and have done a great deal of work of that kind in inspecting and testing materials.

Q. I mean where you had charge of the construction?

A. No, I never had charge of any other construction work, but as far as being a construction engineer is concerned I have been employed on various works as inspecting engineer in charge of the testing of the material which go into constructing the concrete work, cement, and so on.

Q. These lime manufacturing plants that you constructed, were they built of stone or concrete?

A. They had concrete foundations.

Q. And stone superstructure?

A. Generally steel and galvanized iron superstructure.

Q. You used the ordinary concrete mixture in these foundations, did you?

A. Yes.

Q. In your direct-examination you testified to some length about the method of applying this grout, as you termed it, now can you give any instances where machines were used for the purpose of injecting the liquid cement into the interstices or voids between crushed rock as far back as ten years ago, we will say?

A. To my knowledge machines were not used for that purpose any longer ago than ten years; they may have been used, but not to my personal knowledge, but during the ten years of my experience there have been several machines used for placing cement grout in rock foundations and other structures where crushed rock has been used.

Q. Can you tell of any that were used as long ago as ten years?

A. There have been machines in existence, grouting machines, as far back as thirty years ago, used for the purpose of depositing concrete under water through pipes, used for the purpose of filling up voids in crushed rock formations.

Q. That is something different from what we are talking about now?

A. It is absolutely the same process as I consider it. It is forcing a cement mixture into a rock formation which is full of holes to fill up the holes.

Q. Have you ever known that process to be used in laying street pavements prior to 1906?

A. I have known concrete to be used in pavements ever since Portland cement has been used.

Q. I do not speak about concrete—I am asking about the method that you have described?

A. Not by these machines to my knowledge, no.

Q. Are you engaged in any construction work now as constructing engineer?

A. No.

Q. Have you ever had any experience in laying pavement?

A. As construction engineer?

Q. Yes.

A. No, I have never taken a contract to put a pavement down. I was engaged by Kibbe-Welton Co. to supervise their mixture and to do testing for them.

Q. That is the kind of work you do for the Portland Railway, Light & Power Company?

A. I do all their work as far as inspecting the material is concerned, and at present we are retained on similar work at Seattle, and have charge of all the in-

spection work at Salmon Bay where they expect to use over a quarter of a million barrels of cement.

Q. What engineer had charge of the dam on the Clackamas river that you speak of which was built for the Portland Railway, Light and Power Company?

A. Mr. R. Fisher had charge of the actual work.

Q. What other engineer worked there?

A. There was a Mr. Cushman, I think his name was, who worked for Mr. Fisher.

Q. What part of the time were you there?

A. I was there all of the time until it was completed.

O. After you finished as inspecting engineer on that dam what work did you undertake then?

A. I have a large engineering practice here in the city. I have inspected nearly all the materials which have gone into the large buildings here in the city since I have been here.

Q. Your specialty is inspecting the materials as it is being used that go into the structures?

A. Yes, I am a chemical engineer and inspect the materials, the cement and concrete that go into the structures, yes.

REDIRECT-EXAMINATION BY MR. HALL:

Q. How long have you been familiar with the process of pouring concrete into broken rock formations for the purpose of filling up the interstices or voids?

A. You mean my actual experience?

Q. Yes, and from your study and reading?

A. Probably for twelve years.

Q. Have you ever studied and read up the history of grouting?

A. I have.

Q. In your reading and studies have you read of the mixing of concrete or cement in a fluid mixture and pouring it into rock formation, or forcing it into the voids or spaces between the crushed rock to fill up the spaces or interstices?

A. Yes, for years back.

Q. Can you give any citations or references on that subject that you can now call to mind?

A. I don't know that I can cite any particular work from memory. The method has been employed so much and it is so common, especially as applied to work under water that it would not be difficult to find many citations or references; pouring grout through a tranie or pipe has been known for years and it is a very common method, and commonly used for pouring the grout or a rich mixture of concrete under water.

Q. What force, if any, is used to force the grout other than gravity?

A. Well, in that particular method, the force of gravity alone when poured through a pipe sixty to seventy feet long, with the weight of the rich mixture in a four or five inch pipe would be sufficient.

Q. Would that be the same in constructing columns or piers?

A. Well, probably some extra force might need to be used in columns, piers and some foundations, and in filling rip-rap in reservoirs and the like. It is a very common method.

ROBERT S. EDWARDS.

Adjourned until November 17, 1912, at ten o'clock A. M.

PORTLAND, Oregon, November 17, 1912.

Parties met, pursuant to adjournment at the same place on this date, and the following proceedings were had, to wit:

Counsel for defendants thereupon offered the following exhibits:

1. Certified copy of letters patent granted to John Murphy, No. 238,706, granted March 8, 1881, for improvement in pavements. Published in the official Gazette, Vol. 19, in March-April, 1881, and now being in the Public Library of the City of Portland, Oregon.

The same was received and marked Defendants' Exhibit "A."

2. Certified copy of letters patent No. 381,667 dated April 24, 1888, for improvement in concrete pavements, granted to George A. Bayard, the same being published in Official Gazette, Vol. 43, page 435, in the Public Library of the City of Portland, Oregon.

The same was received and marked Defendants' Exhibit "B."

3. Certified copy of United States letters patent No. 413,278, October 22nd, 1889, granted to Thomas F. Hagerty, for improvement in concrete pavements, the same being published in Volume 49, page 452, of the Official Gazette, a copy of which is on file in the Public Library at Portland, Oregon.

The same was received and marked Defendants' Exhibit "C."

4. A portion of page 3557 of the Century Dictionary copyrighted 1889-1895 by the Century Company, and reads the same into the record as follows:

“MACADAMIZATION:

“The process of laying carriage roads according to the system of John Loudan Macadam, Scottish engineer, (1756-1836), who carried it out very extensively in England. In the common process the top soil of the roadway is removed to the depth of 14 inches. Coarse cracked stone is then laid in to a depth of seven inches and the interstices and surface depressions are filled with fine cracked stones.

“Over this is placed a bed laid seven inches deep of road metal or broken stone of which no piece is larger than two and one-half inches in diameter. This is rolled down with heavy steam or horse rollers and the top is finished with stone crushed to dust and rolled smooth.”

5. An article entitled “Roads and Streets,” Volume 20, “Encyclopedia Britannica,” Ninth Edition, published by R. S. Peale Company, Chicago, 1892, the R. S. Peale Company reprint.

For convenience counsel reads the same into the record as follows:

“ROADS AND STREETS. The earliest roads about which anything definite is known are those of ancient Rome, one of the oldest of which and the most celebrated for the grandeur of its works—the Appian Way—was commenced 312 B. C. Roman roads are remarkable for preserving a straight course from point to point regardless of obstacles which might have been

easily avoided. They appear to have been often laid out in a line with some prominent landmark, and their general straightness is perhaps due to convenience in setting them out. In solidity of construction they have never been excelled, and many of them still remain, often forming the foundation of a more modern road, and in some instances constituting the road surface now used. It is consequently possible, with the help of allusions of ancient writers, to follow the mode of construction. Two parallel trenches were first cut to mark the breadth of the road; loose earth was removed until a solid foundation was reached; and it was replaced by proper material consolidated by ramming, or other means were taken to form a solid foundation for the body of the road. This appears as a rule to have been composed of four layers generally of local materials, though sometimes they were brought from considerable distances. The lowest layer consisted of two or three courses of flat stones, or, when these were not obtainable, of other stones, generally laid in mortar; the second layer was composed of rubble masonry of smaller stones, or a coarse concrete; the third of a finer concrete, on which was laid a pavement of polygonal blocks of hard stone jointed with the greatest nicety. The four layers are found to be often 3 feet or more in thickness, but the two lowest were dispensed with on rock. The paved part of a great road appears to have been about 16 feet wide, and on either side, and separated from it by raised stone causeways, were unpaved side-ways, each of half the width of the paved road. Where, as

on many roads, the surface was not paved, it was made of hard concrete, or pebbles or flints set in mortar.”

* * * * *

“The turnpike roads were generally managed by ignorant and incompetent men until Telford and Macadam brought scientific principles and regular system to their construction and repair. The name of Telford is associated with a pitched foundation, which he did not always use, but which closely resembled that which had been long in use in France, and the name of Macadam often characterizes roads on which all his precepts are disregarded. Both insisted on thorough drainage and on the use of carefully prepared materials, and adopted a uniform cross section of moderate curvature instead of the exaggerated roundness given before; but, while Telford paid particular attention to a foundation for the broken stone, Macadam disregarded it, contending that the subsoil, however bad, would carry any weight if made dry by drainage and kept dry by an impervious covering.”

* * * * *

“The thickness to be given to a road made altogether of broken stone will depend on the traffic it is intended for. On a good well-drained soil a thickness of 6 inches will make an excellent road for ordinary traffic, and Macadam’s opinion that 10 inches of well-consolidated material was sufficient to carry the heaviest traffic on any substratum if property drained has proved to be generally correct.

Whenever it is possible a new road should be finished with a roller. The materials are

consolidated with less waste and wear and tear of vehicles and horses is saved. Horse-rollers if heavy enough to be efficient, require a number of horses to draw them and are cumbersome to use. A ton or a ton and a half weight per foot of width is desirable, and to obtain it a roller 4 feet wide must be loaded to 5 or 6 tons, and will require as many horses to draw it. In Great Britain horse-rollers have to a great extent been superseded by steam road rollers in consequence of the superiority and economy in the work done. A 15-ton roller, 7 feet wide, giving upwards of 2 tons weight per foot, can thoroughly consolidate 1,000 to 2,000 square yards of newly-laid materials per day. The materials should be formed to the proper section, and not more than 4 or 5 inches in thickness; if a greater thickness is required it is better to roll two coats separately. After several passages of the roller any hollows must be filled up with small materials, and the rolling must be continued until it causes no motion among the stones. When this result has been attained the binding material may be added. It should be spread dry and uniformly in moderate quantities and should be rolled into the interstices with the aid of watering and sweeping. Provided that all the interstices in the upper stratum of stones are filled after the stones are thoroughly consolidated, the less binding that is used the better. By using binding in larger quantity, and before the stone is thoroughly consolidated, the amount of rolling required is less.'

“A foundation of cement concrete 6 inches thick was used by Sir John Macneill on the Highgate Archway (London) road on a bad clay bottom, and common lime concrete was subsequently used elsewhere. A bed of lias lime concrete 12 inches thick was laid as a foundation in Southwark Street and on the Thames Embankment, but it is too expensive for a macadamized road under ordinary circumstances.”

* * * * *

“Stone for a new road should be evenly broken to a size that will pass every way through a ring $2\frac{1}{2}$ inches in diameter. For repairs, especially when the material is tough, a gauge of $2\frac{1}{4}$ or 2 inches may be used with advantage, as the stone covers a larger surface, consolidates sooner, and makes a smoother surface. Stone is best broken by hand, but stone-breaking machines have been introduced which supercede hand-breaking to some extent, especially where large quantities of hard stone are to be broken. There is always a certain amount of crushing in breaking by a machine, from which softer stones suffer more, and machine-broken stone is never nearly so cubical, uniform in size, or durable as stone well broken by hand. Broken road material contains about 55 per cent. of solid stone to 45 of void space. In a well-consolidated road the void is filled up by small fragments, detritus, and mud, the result of wear, and specimens of good road surfaces weigh from 93 to 95 per cent. of the weight of the solid stone of which they are made.”

* * * * *

“Concrete macadam, formed by grouting with lime or cement mortar a coat of broken stone laid over a bed of stone previously well rolled, has been tried as an improvement on an ordinary macadamized surface, but not hitherto with much success. When cleanliness is of importance, and great durability is not required, tar macadam or bituminous concrete may be usefully employed. It is sometimes made by first spreading a coating of broken stone and consolidating it by a roller, and then pouring over it a mixture of coal-tar pitch, and creosote oil, upon which a layer of smaller stone is spread and rolled in, and the surface finished with stone chippings rolled in. More usually the broken stone and bituminous mixture are well incorporated together before they are spread, the stone sometimes being previously heated. The lower layer, about 4 inches thick, may be of stone broken to $2\frac{1}{2}$ inches gauge, and the next layer, about 2 inches thick, may be of smaller stone. Each layer must be well rolled, and when perfectly solid a thin coating of fine stone or granite chippings is spread over the surface and rolled in.”

* * * * *

“A foundation of bituminous concrete is sometimes used where only a thin bed can be laid, in consequence of there being an old foundation which it is undesirable to disturb. It is made by pouring a composition of coal-tar, pitch, and creasote oil while hot over broken stone levelled and rolled to the proper form, and then spreading a thin layer of smaller broken stone over the surface and rolling it in.

It has the advantage that it can be paved upon a few hours after it has been laid.”

* * * * *

“Joints simply filled in with gravel are of course pervious to water, and a grout of lime or cement does not make a permanently water-tight joint, as it becomes disintegrated under the vibration of the traffic. Grouted joints, however, make a good pavement when there is a foundation of concrete or broken stone or hard core.”

* * * * *

“A concrete foundation for a wood pavement appears to have been first employed in a pavement laid in 1872 in Gracechurch Street by the Ligno-Mineral Company.”

* * * * *

“The adoption of a bed of concrete as the weight-bearing foundation of the road marks a new departure, and in all the more recent systems of wood pavement a substantial foundation of concrete is an essential feature. In Norwich, however, a large quantity of wood pavement has been laid on the old street foundation, the blocks being bedded in gravel and sand rammed, and the joints grouted with lime and sand.”

* * * * *

“It is now more usual to bed the blocks directly on the concrete, a smooth surface being formed either with the concrete itself or by a floating of cement, and to fill the joints with a grout of cement and gravel.”

* * * * *

“Wood pavements of plain blocks on a cement concrete bed are now (1885) laid at from 10s. 6d. to 12s. 6d. per square yard, a considerable reduction on the prices paid for patented systems a few years ago.”

* * * * *

“COMPARISON OF STREET SURFACES.—The comparative cost of various street surfaces in Liverpool, including interest on first cost, sinking fund, maintenance, and scavenging, when reduced to a uniform standard traffic of 100,000 tons per annum for each yard in width of the carriage-way, is given by Mr. Deacon as follows:

	Per square yard per year.	
Set pavement of hard granites..		11½d.
“ “ “ softer granites	1s.	2¾d.
Bituminous Concrete.....	1s.	10½d.
Wood pavement.....	2s.	2¼d.
Macadam, on hand-pitched foundation.....	2s.	11½d.

Taking the standard of traffic at 40,000 tons per annum for each yard in width, the cost of the last three pavements is:

	Per square yard per year.	
Bituminous concrete.....	1s.	1½d.
Wood pavement.....	1s.	8½d.
Macadam.....	1s.	11½d.

Asphalt paving may be placed between wood and bituminous concrete in the above order. These comparisons show the high cost of a macadamized surface in a street where the traffic is great. However well it may be maintained, a macadamized street must be dirtier

and dustier than any pavement, though it is superior to them all in safety and to set pavements in the matter of noise. Bituminous concrete or asphalt macadam is cheaper, cleaner, and quieter than ordinary macadam and is sufficiently durable when the traffic is not heavy. For heavy traffic no pavement is so economical as granite sets; but for the sake of quiet and cleanliness a wood or asphalt pavement is often preferable. Asphalt can be kept cleaner than any other pavement and is the pleasantest to travel over; wood, on the other hand, is quieter for the residents, less slippery, and can be laid on steeper gradients."

I read into the record and offer as a part of the testimony in this case the following excerpts from a work entitled, PRACTICAL TREATISE ON LIMES HYDRAULIC CEMENTS, AND MORTARS, by Q. A. GILLMORE, A. M., Lieutenant-Colonel U. S. Corps of Engineers, Brevet Major-Gen. U. S. Army. Fifth Edition, Revised and Enlarged. New York.

D. VAN NOSTRAND, PUBLISHER, 23 Murray Street and 27 Warren Street, 1874. The note found in the title page being dated, Headquarters, Dept. of the South, Port Royal, S. C., June 15, 1863, in which the Author states as follows:

"The experiments and researches, which furnish the ground work for all the original matter contained in the following work, were conducted under the authority of the Engineer Bureau of the War Department, and were completed in the summer of 1861. The manuscript was nearly ready for the publisher at the same time.

Since then, active professional duties have rendered it possible for me to devote even a brief personal superintendence to the publication of the work. I am, therefore, not insensible to the many disadvantages under which its hasty publication is now undertaken. It doubtless contains many defects.

For the method of analysis given in Chapter V., I am indebted to Captain E. C. Boynton, U. S. Army, late Professor of Chemistry in the University of Mississippi. Q. A. GILLMORE, Brig.-General.

On Page 250, Section 494: CONCRETE FORMED BY A PASTE OF CEMENT INJECTED UNDER WATER.

Some blocks of concrete were made in the harbor of New York, in 1860, in the course of these experiments, by injecting a thin paste of light colored Rosendale cement (without sand) into boxes filled with coarse gravel and pebbles, and submerged in sea-water. The cement was mixed, in some cases with fresh, in others with sea water, in the proportion by volume of 48 of water to 100 of cement powder. It was poured through a thin pipe $1\frac{1}{2}$ inches in diameter and 18 feet in vertical height. The boxes were $5\frac{9}{10}$ " x $5\frac{9}{10}$ " x 36" clear dimensions, and were perforated with small holes, to facilitate the ejection of the water. At the expiration of some weeks, the boxes were taken from the water, and the blocks removed. The cement was found to have penetrated to the remotest corners of the boxes, and to have filled perfectly the interstices in the gravel and pebbles.

On Page 259, Section 508; under the heading: MEMOIR OF MM. CHATONEY AND RIVOT.

In a memoir submitted to the French Academy

of Sciences in the year 1856, entitled "General Considerations upon Hydraulic Materials used for Constructions, in the Ocean," to which reference is made in other parts of this work, the authors, MM. Chatoney and Rivot, Engineers of Roads and Bridges, are led, as the results of their experiments, to some deductions somewhat at variance with the established usage of European engineers. As many of the points to which they direct special attention can have no practical interest to American engineers, they will not be noticed here.

On Page 259, Section 509: THEY RECOMMENDED PURE CEMENT TO BE USED WITH AN EXCESS OF WATER.

From page 159 of their memoir we quote as follows: We have supposed until now, that the cements should be tempered with a quantity of water just sufficient to obtain the consistency requisite for working it; but, whenever it is possible, it is better to use pure cement in a semi-fluid condition, viz.: with a great surplus of water; in becoming solid, it rejects the water not necessary for hydration, and its texture is much more compact than when tempered to ordinary consistency; it may be said that the molecules, left to themselves in a more liquid medium, arrange themselves better; they are more watery and carry less air with them; for this double reason the mortars are less porous.

On Page 262, Section 515: "PORTLAND" CEMENT USED EN COULIS.

It will be seen that M. Vicat made his trials with the natural cements; M. Chatoney, on the other hand, had reference to the "Portland" cement which had

been used by him "to stop the infiltrations of water under the cut stone of the apron of the Florida Dock, at Havre," the beton on which the apron rested having become so decomposed under the influence of sea-water that the pebbles were no longer bound together by the mortar. The following preliminary experiment was made: A box about six and a half feet long, two and a quarter feet wide, and four inches deep was filled with the pebbles used for concrete, and covered up with a board well loaded down with weights. Into one of the corners of this box was then poured through a vertical tube 1.57 inches in diameter, and 17 feet four inches high a mixture of five parts of Portland cement and two quarts of water. * * * M. Chantoney says: When the box was taken to pieces the cement was found to have penetrated among the pebbles to the extremities of the box, and had transformed them into excellent beton, more compact than could have been made by masons upon a stand. This experiment was deemed so satisfactory that the infiltrations under the dock-apron were stopped by an injection of liquid paste of Portland cement. Some of this cement, which, after completely filling the vacant spaces, had overflowed the apron, and attached itself firmly to the cut stone, was removed and kept in sea-water for testing.

(Note) * * * Some blocks of concrete, noticed in another part of this work, were made in this manner on Governor's Island, New York, in the autumn of 1860.

On Page 278, Section 535: 6th. When cement is to be used without sand, as may be the case when grouting is resorted to, or when old walls are to be repaired

by injections of thin paste, there is no advantage in having it ground to an impalpable powder."

The volume from which these excerpts are taken can be found in the library of Lazell and Edwards, and there is also a copy in the possession of Mr. John T. Whistler, both civil engineers of Portland, Oregon.

7. A book entitled "ROADS AND PAVEMENTS" from the Public Library of Portland, Oregon, and entitled on the inside "A Treatise on Roads and Pavements by Ira Osborne Baker, C. E. Professor of Civil Engineering, University of Illinois, author of Masonry Construction, Engineering, Surveying Instruments. Member of the A. S. C. E., Western Society of Engineering, Society for the Formation of Engineering Education, etc. 1st Edition, 3,000. Published by John Wiley Sons, New York, Chapman Hall, Limited, London, England. 1904, Preface dated November 27, 1902, and for convenience counsel reads the said preface, and certain excerpts from the said book in evidence, as the same appear on the next page hereto.

The said Book was thereupon marked for identification Defendant's Exhibit "D".

The excerpts are as follows:

"PREFACE.

The object of this book is to give a discussion from the point of view of an engineer of the principles involved in the construction of country roads and of city pavements. The attempt has been made to show that the science of road making and maintenance is based upon well-

established elementary principles, and that the art depends upon correct reasoning from the principles rather than in attempting to follow rules or methods of construction.

* * * * *

277. CEMENTING OR BINDING POWER. Binding power is the property possessed by rock dust to act as a cement between the coarser fragments composing a stone road. This property is of the highest value, for the strength of the binder determines the resistance of the road to the wear and tear of traffic more than does the strength of the fragments themselves. It is possessed in a very much higher degree by some varieties of rocks than by others, and its absence is so pronounced in some varieties that they cannot be made to compact under the roller or under traffic without the addition of some cementing agent. This has been studied but little, and only by the Massachusetts Highway Commission, which offers the following tentative conclusion: (Annual Report for 1900, p. 71-2.)

It is difficult to say what brings about this cementation or binding of rock dust. It is clear, however, that with many varieties of rock it is due to several causes. Experiments made on a number of different kinds of rock dust showed that the more finely they were pulverized the higher would be the cementing value when subjected to pressure, both with and without water; and an increase in pressure seems to produce a corresponding increase in cementation. Further than this, in a number of cases similarly made briquettes of the same rock dust give distinct indication that destruction to the bond of cementation by impact bore a definite amount of energy was

required to destroy the bond in each briquette, even when applied in different loads. The inference drawn from such results would be that cementation in such materials is to a considerable extent mechanical,—that is, the interlocking of the fine particles of dust caused by pressure.

Another important fact brought out was, that every variety of rock experimented on gave higher cementing results when compressed while wet, which is analogous to the results obtained by road builders, who almost invariably find that stone screenings compact better when watered before being rolled. This at first led to the belief that this result was entirely due to a chemical change effected by the water; but briquettes made of pulverized glass, mixed with pure alcohol instead of water, gave practically the same results. The only explanation of this fact which at present suggests itself is that any mobile liquid which will wet the fine particles of dust acts as a lubricant, allowing them to come in close contact when under pressure.

By a process little understood, water has the power of attracting the fine particles of rock dust and cementing them together. This is well illustrated when a drop of water falls on a dry hard road surface by the dust immediately buckling into an irregular shape, which is retained until destroyed by some force. On examining one of these little clods after drying, it will be seen that it sensibly coheres. The solidifying of mud by the drying up of puddles of water on clayey soil is another example, and so this same process can be traced even to the clay concretions. These phenomena may be due to totally different causes; nevertheless each is the cementation of rock dust,

brought about by the presence of water, and in each case the finer the dust the more perfect this action. This cementation may be due to chemical action, to physical re-arrangement of the particles, or more likely to a combination of such causes.

278. Although chemical action does not seem to affect the cementing power of stone dust as determined in the laboratory, it is probable that this force plays an important part in the road itself. Many native rocks consist of small bits bound together by a cementing material which was deposited from the water. Pure water will dissolve several of the common constituents of rocks, and its solvent action is materially increased by the acids which it takes up from the atmosphere and from manure and decaying vegetation on the road surface. Water percolating through the road material will dissolve lime, silica, and iron,—common cementing materials in natural rock,—and later deposits them in the interstices of the crushed stone, where they will act as a binding material. This binding action is quite slight, but may have an appreciable effect in maintaining the delicate adjustment of a broken-stone road. This subject has not been investigated, but it is apparently worthy of careful study.

321. The experience at Bridgeport, Conn., is frequently cited to prove that a comparatively thin road is sufficient. Something like 60 miles of 4-inch macadam roads built in that place gave excellent service even under a heavy traffic. The conditions were very favorable for a thin road; (1) the soil was sand or sandy loam, and had fairly good natural drainage; (2) the subgrade was thoroughly rolled with a 15-ton roller; (3) the broken

stone was trap, which is hard and durable; (4) the binder was hard and durable, being either stone dust or siliceous sand, and was free from clay or loam; (5) the binder was worked in until the voids in the crushed trap were practically filled, the effect of frost being thus reduced to a minimum and the soil being prevented from working up from below; (6) the stone was thoroughly consolidated with a steam roller of adequate weight; and (7) the roads were maintained by the system of continuous repairs.

336. ROLLERS. * * * Classified according to the power employed, there are two forms of rollers: the horse roller, and the steam roller. The horse roller was first introduced in France about 1834, and the steam roller in 1865.

341. ROLLING THE STONE. Rolling is a very important part of the construction of a broken-stone road. The sub-grade should be rolled to prevent the stone from being forced into the earth. The lower course of the stone should be rolled to compact it, so that the pieces will not move one upon the other under the traffic; and the top course should be rolled to pack or bind the pieces into place, to prevent their being knocked out by the horses' feet. Rolling accompanied by sprinkling is necessary also to work the binding material into the interstices so as to make the surface water-tight.

345. BINDING THE ROAD. The interstices between the fragments of stone should be filled with a fine material which will act mechanically to keep out the rain water and thereby keep the sub-grade dry, and also to support the fragments and prevent them from being broken, and which will act physically and possibly also chemically to bind

or cement the fragments into a single more or less solid mass. The proper binding of the stone is the most important part of the construction of a broken-stone road.

The material employed to fill the interstices in a broken-stone road is usually called the binder, and sometimes the filler.

347. APPLYING THE BINDER. There is a difference of opinion among competent engineers as to the best method of applying the binding material. Some apply it on the top of each course, and some on top of only the last course. In the first case, all the voids from the bottom to the top of the road are filled with fine material; in the second case, the binder usually fills the voids of the top course only. Those who advocate the first method claim that the whole mass should be filled to prevent the stones from moving under the traffic, and also to prevent the soil from working up from below; while the advocates of the second method claim (1) that filling the top layer is sufficient to hold the stone in place near the surface, (2) that the stones of the lower courses have no tendency to move, (3) that the unfilled voids of the lower course promote drainage, and (4) that as the upper layer wears away, the dust will wash down into the lower open spaces in such a manner as always to keep the 3 or 4 inches just below the surface properly bound. If the stone is hard, or if the lower courses are not thoroughly rolled, applying the binding material only on the top of the last course practically fills the voids to the earth foundation; but of course it is cheaper to apply the filler on the top of each course than to attempt to fill all of the voids by applying it on the top course only. If the stone in the lower

courses is soft, or if the top of the next to the last course is thoroughly rolled, applying the binder on the top fills the voids in the top course only. It is sufficient to fill the voids of the top course.

The binder is applied by spreading a layer of "fines" about half an inch thick over the partially rolled surface. The filler should be dumped upon a board platform, and not directly upon the road surface; and should be distributed evenly over the stone with a shovel. Under no consideration should loam or vegetable matter be allowed to contaminate the stone screenings. After the binding material has been evenly distributed, the surface is then sprinkled and rolled. The sprinkler should have many fine openings, the object being to give a gentle shower rather than a violent flooding. The water washes the fine material into the cavities below, and the roller crushes the small fragments and makes more dust. The rolling also aids in working the binder into the mass; in fact, the binder can be worked in to a considerable extent by dry rolling, and consequently the quantity of water used varies widely with the method of doing the work, but is usually about 4 to 6 cubic feet per cubic yard of stone. Sometimes men with heavy brooms are kept upon the road sweeping the binding material about to assist in working it in, and also to secure a more uniform distribution of it. While applying the screenings care should be taken to pick off any coarse stone—particularly flat ones,—as they do not bind well and their subsequent loosening causes the road to ravel (Sec. 377).

As the rolling and sprinkling proceed, fine material should be added where needed, *i. e.*, as open spaces appear. All the filler should not be put on in the beginning, since a thin layer can be worked in to better advantage than a thick one: and, besides, it is desirable to use only enough to fill the voids.

Occasionally the surface of the road becomes muddy and sticks to the roller. This can be remedied in either of two ways: *viz.*, by sprinkling the roller and keeping it constantly wet, or by keeping the sprinkling wagon immediately in front of the roller and having the binder always fully saturated. The rolling is continued until the water is forced as a wave in front of the roller and until the surface behind the roller is mottled or puddled and is covered with a thin paste. The binding, or the puddling of the surface, can not be done satisfactorily when the surface freezes nightly.

When finished, if the road is allowed to dry and is then swept clean, the surface will be seen to have the appearance of a rude mosaic, the flat faces of the fragments of stone being crowded against one another and the interspaces being filled with the binding material—the latter occupying about half of the area. Such a surface when dry will stand considerable sweeping with a steel broom or brush without fragments of stone being loosened. The water used in construction not only aids in working the binder into the interstices, but also develops the cementing power of the rock dust.

563. BITUMINOUS CONCRETE. In England a mixture of broken stone and tar, often called bituminous concrete, is sometimes used as a founda-

tion. The only advantage claimed for it is that the pavement may be laid as soon as the foundation is completed and therefore it is more suitable for busy thoroughfares than hydraulic cement concrete. The bituminous concrete is sometimes laid as described in Sec. 709, and sometimes by spreading and rolling the broken stone, and pouring tar* over the surface and then covering that with a thin layer of small stones and finally rolling. This foundation is more expensive and less reliable than hydraulic cement concrete.

ASPHALT MACADAM.

Asphalt may be used instead of coal or gas tar, but it will not adhere to the stone unless both are at a higher temperature than that of the ordinary atmosphere. For a method of heating and mixing stone and asphalt (see Sec. 600). On account of the expense asphaltic concrete is seldom used for a pavement foundation.

695. Very recently it has been proposed to use asphalt as a binding material for crushed stone, the resulting product usually being called asphalt macadam, but sometimes, and less appropriately, bituminous macadam. Doubtless this use of asphalt has been suggested by a former and similar use of coal tar (see Sec. 700). Asphalt concrete would not be an inappropriate name. There are two slightly different methods of applying the asphalt, both of which have been patented. They will be referred to as Warren's and Whinery's, after the inventors.

696. WARREN'S METHOD. * * * Upon the subsoil is placed a 4-inch layer of broken stone which is thoroughly rolled. On this stone foundation is spread a coat of thin asphaltic cement,

which enters the interstices of the stone, holding its fragments together and forming a surface with which the wearing coat will readily and firmly unite. The asphalt macadam consists of a mixture of asphaltic cement and broken stone, the fragments of the latter varying from 1 to 2 inches in the largest dimensions to fine dust. The ingredients of the asphaltic macadam are mixed about as described for the wearing coat of the ordinary asphalt pavement (Sec. 627). The mixture of asphaltic cement and stone is spread, while still hot, of such a thickness as to be 2 inches after being thoroughly rolled with a road roller (336) weighing 15 to 20 tons. On top of the asphalt macadam is spread a layer of asphaltic cement, partly to seal the surface against the entrance of air and water, and partly to bind together the fragments forming the wearing surface. While the surface of the asphaltic cement is still sticky there is spread over it a thick coat of fine stone chips, which are then rolled and the road is ready for traffic.

The finished roadway presents a rough gritty surface, which has more of the characteristics of an ordinary broken-stone road than of the usual asphalt pavement. Less asphaltic cement is required for a given thickness of asphalt concrete than for the asphalt mortar of the wearing coat of the ordinary asphalt pavement, since the larger the fragments of the aggregate the less the per cent. of voids, and consequently the less cement required. It is claimed that no single stone has been dislodged in any of the seven cities in which experimental sections have been built. It is also claimed that asphalt macadam is superior to ordinary asphalt pavement, since the angular frag-

ments of the broken stone used in the former are less mobile than the rounded sand grains used in the latter, and hence the cement in the former may be made softer and may also be worked at a lower temperature than in the latter. The softer the asphaltic cement, the more durable it is; and the lower the temperature at which it is worked, the less the danger of damage by overheating it.

697. WHINERY'S METHOD. * * * The foundation may be either broken stone or hydraulic cement concrete, depending upon the relative cost of the two and also upon the supporting power of the subsoil. The wearing coat consists of a layer of crushed stone, the voids of which are filled with a mixture similar to that used for the wearing coat of sheet asphalt pavements. Broken stone of properly graded sizes is spread on the foundation to the requisite thickness, which, either before or after it is thus spread, is heated to a temperature of about 300° F. A hot mixture of asphaltic cement and mineral grains is spread over the top of the layer of hot crushed stone in a sufficient quantity to fill the voids in the stone and to level up the unevenness of the surface, the layer being properly graded with paving rakes. Then this operation is completed a steam roller of the asphalt type weighing not less than ten tons is to be operated over the surface until (1) the plastic composition is forced into the voids in the crushed stone, (2) the unevenness of the surface is filled up, and (3) the whole mass is thoroughly compressed and solidified. The roadway is then complete, and after giving it time to become cold and hard the street is opened to travel.

No pavement of this kind has been constructed, but the inventor, an engineer of large experience

in laying asphalt pavements, claims that it will have the following advantages over ordinary sheet asphalt pavements: 1. The first cost will be materially less. 2. It will offer a better foothold to horses. 3. It will be at least as durable as the ordinary sheet pavement. 4. It will not shift under travel and work into waves. 5. It will not crack. 6. It can be repaired more cheaply and with less skilled labor than can the ordinary sheet pavement. On the other hand the asphalt macadam will not be so smooth and probably not so noiseless as the ordinary asphalt pavement.

709. TAR MACADAM. Broken stone with a tar binder has been used for road purposes in a comparatively small way in England for twenty or thirty years past; and the experience of Hamilton, Ontario, Canada, with this form of pavement has lately attracted considerable attention in this country. In a general way, two methods have been employed in using tar as a binder for broken stone, viz.: (1) the broken stone is mixed with sufficient tar more or less nearly to fill the voids, and then the mixture is deposited and compacted, the process being very much the same as that employed in laying hydraulic cement concrete; or (2) the broken stone is laid and rolled, and then a layer of tar is added and rolled, the intention being to force the tar into the interstices of the broken stone much as the stone-dust binder is worked into a broken-stone road. The product in the first case could appropriately be called tar concrete, and in the second, tar macadam; and they will be so designated in this discussion. The former seems to be the more common in England, and the latter in Canada. Notice that these two methods are substantially the same as Warren's

and Whinery's method for making asphalt macadam—Secs. 696 and 697, respectively.

711. THE CONSTRUCTION. The subgrade is prepared as for a pavement or for the ordinary broken-stone road, and the foundation consists of a layer of broken stone, usually 4 inches thick, which is thoroughly rolled.

In making tar concrete, care must be taken thoroughly to mix the tar and the stone, the former being hot and the latter dry. The mixing is done with shovels on a board platform, the tar being poured over the stone. Each fragment of stone should be thoroughly covered with tar; but more tar than enough to fill the voids is objectionable, since it increases the cost and decreases the durability of the road. Usually 10 or 12 gallons are required for a cubic yard of unscreened stone. The mixture is then placed in the road, and rolled while hot with the usual road roller, sand or dust being sprinkled over the surface to prevent the tar from sticking to the roller. Only a comparatively small amount of rolling is required to consolidate the mass. Not infrequently a wearing coat, consisting of a half inch to 1 inch of tar and screenings, is added on the top of the tar concrete; and herein the two methods referred to above merge one into the other.

In laying tar macadam, the broken stone is rolled until the fragments do not move under the foot in walking over the surface, and then a layer of hot tar is poured upon the surface and is evenly spread over it with brooms or shovels, after which it is rolled. If honeycombed spots appear while the rolling is in progress, more tar is added. After the surface of the layer of broken stone has been thoroughly filled with tar, the surface is

flushed with moderately soft tar, and over this is strewn a thin layer of stone chips about $\frac{1}{8}$ to $\frac{1}{4}$ inch in longest dimensions; and then the surface is again rolled, after which the road is thrown open to traffic.

321. The experience at Bridgeport, Conn., is frequently cited to prove that a comparatively thin road is sufficient. Something like 60 miles of 4-inch macadam roads built in that place gave excellent service even under a heavy traffic. The conditions were very favorable for a thin road; (1) the soil was sand or sandy loam, and had fairly good natural drainage; (2) the subgrade was thoroughly rolled with a 15-ton roller; (3) the broken stone was trap, which is hard and durable; (4) the binder was hard and durable, being either stone dust or siliceous sand, and was free from clay or loam; (5) the binder was worked in until the voids in the crushed trap were practically filled, the effect of frost being thus reduced to a minimum and the soil being prevented from working up from below; (6) the stone was thoroughly consolidated with a steam roller of adequate weight; and (7) the roads were maintained by the system of continuous repairs.

It is agreed and stipulated between counsel that the exhibits offered by defendants shall remain in possession of defendants' counsel until the hearing.

Thereupon the hearing was adjourned until November 23, 1912, at 10 o'clock A. M.

PORTLAND, Oregon, November 23, 1912.

Parties met pursuant to adjournment and the following proceedings were had, to wit:

J. H. JOHNSON, called as a witness on behalf of the defendants, after being duly sworn, testified as follows:

DIRECT-EXAMINATION BY MR. STEARNS:

Q. State your age, residence and occupation?

A. Age 45, residence 20 East 10th street, occupation municipal contracting business.

Q. You live in Portland, Oregon?

A. Yes.

Q. Are you the president of the Consolidated Contract Company?

A. Yes.

Q. Have you had charge of laying street pavement?

A. I have.

Q. Will you describe the mode of laying the pavement which is described or specified in the pleadings as Hassam?

A. Describe the way we have done it, do you mean?

Q. Yes.

A. We start at a good subgrade, establish the grade and roll it smooth, and then we put on seven to eight inches, as the case may be, of crushed rock, three to three and a half inches in diameter—rock that will pass through a three to three and a half inch mesh; of course there will be some smaller rock in with it.

We shake that all up and turn it over and take out all the dirt, and put it on the surface and roll it down thoroughly with a ten ton roller four to four and a half feet wide; we roll that rock and get it as evenly distributed and smooth on top as we can, and go over it with a leveler; we roll that thoroughly with this ten ton steam roller.

Q. How compact is it when you go over it with the ten ton roller?

A. It usually goes down—as I said we put on seven to eight inches of the loose rock on top, and roll that down to about six inches; when we get through rolling it is usually very close and tight and just as compact as you could get it with a roller of this kind. You could almost drive a team over it without disturbing the mass; of course you might jar some of the top pieces loose, but never to any great extent.

Q. Would it be possible to walk over this compact mass without causing any movement in the stone?

A. Oh, yes, as a rule there are no voids at all and the surface is smooth and level and very compact. Walking over it would cause no movement.

Q. I mean by my last question could a person walk over it without disturbing the stone or causing any movement in the surface of the rock?

A. Yes, you could easily. As I said walking over it would not disturb it at all; it looks very smooth and is also very hard. I supposed if you should happen to step cornerwise on one piece, or something like that, you might displace a few pieces, but as a rule that would not happen.

Q. What is the next step?

A. We grout it, by pouring in cement and sand mixed with water. Our contract calls for a mixture of one to two. One part cement and two parts sand. That is made into a thin mixture, the best description I could give of that would be that it is mixed up about as thick as soup, a medium soup.

Q. That is made with sand and cement?

A. Sand, cement and water. We have two tanks one mixing, while the other one keeps an almost constant stream of thin cement grout pouring onto the pavement until it comes up to the surface; the water and cement shows on the surface. When that is done we run over it with a five ton roller back and forth and that leaves the surface somewhat rough; it don't look as smooth as it did before; then we tamp it with iron tampers; tamp the rough spaces all down, and we finish it with big wide wire brooms. The top coating is made richer than the rest of the mixture. We often put more cement in that than we use in the bottom. As the cement begins to set the finisher goes over it with the finishing broom for the purpose of finishing it up, puts on the finishing touches.

Q. Do you put on another layer of stone, or other material, after the first rock is laid?

A. Well, they use a little bit, yes, before it is completed, of what they call inch rock, peastone,—they use a little bit of that.

Q. Is that peastone sprinkled all over the surface to fill up the depressions?

A. It was merely put on to fill up the depressions

or any loose places on top; we usually use the tampers and tamp these places even, and this light roller going over the top has a tendency to shoot up some of the rock, and that we tamp down.

Q. What do you say as to whether or not the mass of the rock is agitated by the five ton roller?

A. No it would not agitate or move the rock any to go over it with the five ton roller after the ten ton roller has been over it.

Q. Do you find, from your experience in laying pavements as you have described, voids in the rocks which have to be filled?

A. Yes, and there is only one way we can cause the voids to be filled up, and that is by pouring in the thin cement which runs in all these voids, and it certainly fills them all up, and is the only way that could be done satisfactorily that I know of now. We pour that material over the top until it stands on top of the street. If it does not fill as it goes down it fills as it comes up. We put that thin grout on until it stands on top of the finished street.

Q. Have you ever seen the bitulithic pavement laid?

A. Yes. They were laying that over in Beaumont when we were putting in the sewer over there. I was there every day while they were putting that down.

Q. What difference, if any, is there between laying the foundation of the bitulithic pavement and the Hassam?

A. There is no difference practically, except the main foundation of the bitulithic is not laid so thick. They put on a two inch top, after they get their base laid.

Q. They have a four inch base instead of a six?

A. Yes, and then on top of the four inches they put two inches more.

Q. Is that the rule?

A. Yes.

Q. What kind of a roller do they use to roll it with?

A. They use a ten ton roller, three wheeled roller, some different than the one we have. They use a tandem roller, too, the same as we use.

Q. How is the bitulithic pavement finished after the foundation is laid?

A. They pour on this plastic material, it is an asphalt, that is poured on hot and goes down through the 4 inch layer of rock.

Q. State whether or not it is rolled after they put that on?

A. Not rolled after the tar is put on. They roll the top after they put that on, however.

Q. At my request did you get specimens of bitulithic pavement and bring it here?

A. Yes.

Q. I show you a piece and ask you if that is the specimen you brought?

A. Yes.

Q. Where did you get it?

A. I got it up on Third and Columbia where they are cutting the pavement to lay a sewer. A piece is broken off on the lower edge which fits into this indentation.

Thereupon counsel for defendants offer said specimen of bitulithic pavement in evidence, and the same is labeled and marked as follows:

“Bitulithic pavement, Defendants’ Exhibit “E,” offered by witness J. H. Johnson, November 23rd, 1912, in case of Hassam Paving Company, *et al. versus* Consolidated Contract Company, *et al.* Julia K. Sayre, N. P.”

Q. You obtained this sample at Third and Columbia streets, Portland, Oregon?

A. I am not sure whether it was Third or Second and Columbia.

Q. I will ask you whether the street from which you took that piece of pavement is paved with that sort of pavement?

A. Yes, I took that right away from where they cut it out.

Q. Did you also obtain a section of Hassam pavement, so-called?

A. Yes.

Q. Some you have laid yourself?

A. Yes.

Q. Where did you get it?

A. Down on Milwaukee street where we are working now, just finishing up a job down there.

Q. Is this the specimen which you obtained and brought here?

A. Yes, sir.

Q. The flat portion is the surface of the street?

A. Yes.

Q. And the rough surface showing the dirt on it is what?

A. It is taken next to the ground.

Thereupon counsel for defendants offer said specimens in evidence and the same is labeled and marked as follows:

“Hassam Pavement, Defendants’ Exhibit “F,” offered by witness J. H. Johnson, November 23rd, 1912, in case of Hassam Paving Company *vs.* Consolidated Contract Company, *et al.* Julia K. Sayre, N. P.”

It is consented and agreed that the two exhibits “E” and “F” may remain in custody of defendants’ counsel until the hearing.

CROSS-EXAMINATION BY JUDGE CAREY:

Q. You are the president of the defendant company?

A. Yes.

Q. How long have you been president?

A. Since its organization.

Q. Have you had charge of this work you have been describing?

A. Yes, I am one of the company that has charge of the outside work altogether.

Q. Have you in charge the operation or laying of the pavement?

A. Yes.

Q. When did you lay this pavement of which this exhibit “F” is a part?

A. That was laid along about August, 1912.

Q. Since this suit began?

A. Yes.

Q. You took that from Milwaukee Street, did you?

A. Yes.

Q. Your company is laying how much pavement on Milwaukee Street?

A. 28,950.8 yards.

Q. Has the work been accepted by the city?

A. No, we are not quite through. We are just completing it now, and it has not yet been accepted.

Q. You have laid other streets in the city?

A. Yes.

Q. Did you lay them in the same manner?

A. Yes.

Q. What streets?

A. Commercial Street was the first one we laid. That was begun about a year ago last July.

Q. What others?

A. Gantenbein Avenue and a piece on Union Avenue and a short piece of five or six blocks on East Yamhill, and Macadam Street in South Portland.

Q. All these have been laid since this suit was begun?

A. No, I think they began this suit about the time we finished Commercial Street.

Q. How much work did you have on Commercial Street?

A. I am not positive now. It started at Killingsworth Avenue on the north. It has been quite a while ago for me to remember back. If I remember right it was about 22,000 yards.

Q. It was several blocks?

A. Yes.

Q. That was the first street you laid?

A. Yes.

Q. This suit was begun when you first started laying Hassam pavement?

A. Well, it was begun not exactly when we first started, it was a short while after that. I think we had started Gantenbein Avenue, in fact I think we had completed Gantenbein before this suit was commenced.

Q. All of this pavement that you have laid has been laid in the manner you described here in your testimony?

A. Yes.

J. H. JOHNSON.

Counsel for defendants offer in evidence United States Patent granted to Frederick J. Warren of Newton, Mass., on pavement of roadways, issued June 4, 1901, being No. 675,430, and the same was marked Defendants' Exhibit "G".

It was agreed that said exhibit should remain in the custody of defendants' counsel until the hearing.

Thereupon counsel for defendants offered the following definition of GROUT found in Century Dictionary, copyrighted 1889, 1895, 1897, 1898, by the Century Company, publishers note being dated November, 1897. Vol. 3, Droop E. F. G.

GROUT. *v.* n. 1. "A thin coarse mortar poured into the joints of masonry and brickwork. A casing of stone outside, a foot and a half thick, also covered the rubble and grout work of Rufus. Harpers Mag. LXIX. 437."

2. "A finishing or setting coat of fine stuff for ceilings. E. H. Knight."

"II. a. Made with or consisting of grout.—Grout wall, a foundation or cellar-wall formed

of concrete and small stones, usually between two boards set on edge, which are removed and raised higher as the concrete hardens.”

“GROUT 2 (Grout) v. t. To fill up or form with grout, as the joints or spaces between stones; used as grout.”

“If Roman, we should see here foundations of boulders bedded in concrete and tiles laid in courses, as well as ashlar facing to grouted insides.”

Athenaeum, Jan. 21, 1888, p. 91.

“The mortar being grouted into the joints and between the two contiguous courses of front and common brick. C. T. Davis Bricks and Tiles, p. 51.”

Counsel for defendants offer in evidence Ordinance No. 21,172, passed by the Council of the City of Portland, Oregon, on April 27, 1910, approved by the Mayor on May 4, 1910, Joseph Simon, Mayor, and the same is marked Defendants' Exhibit “H”.

Counsel for complainant objected to the offer of said exhibit as incompetent, irrelevant and immaterial, but waives all objection as to the manner or form of making the proof.

Counsel for defendants offers in evidence Sections 374, 375, 376, 377, 378 and 379 of the Charter of the City of Portland, and the same will be produced by Counsel at the hearing.

Counsel for complaint make the same objection as he made to Exhibit “H”.

Thereupon further proceedings were adjourned until November 26th, 1912, at 10 o'clock A. M.

PORTLAND, Oregon, November 26, 1912,
10 A. M.

Parties met pursuant to adjournment and the following testimony was taken, to wit:

J. H. JOHNSON, was called and testified as follows:

DIRECT-EXAMINATION BY MR. STEARNS:

Q. Mr. Johnson, it has been testified by one of the witnesses for complainant that for the purpose of properly agitating the grout a steam roller is preferably employed which may be the same as that used for compressing the stone. I wish you would state what your experience has been in regard to agitating the grout with the same roller used for compressing the stone after the stone has been compacted by rolling with a ten-ton roller?

A. That would be most impossible to agitate the grout or to even roll it with a ten-ton roller after the base is wet with the cement, sand and water, from the fact that it bogs itself right into the rock. The weight of the roller or the friction on the wet rock won't go—it won't do at all.

Q. What effect then upon the stone does the grout have?

A. The grout wets the stones and makes them slippery.

Q. What is the reason that you use in your operations a five-ton roller after the grout is on, instead of a ten-ton roller?

A. It is simply to get over the surface. It is lighter and we run it over the surface to smooth it.

Q. What effect does the five-ton roller have upon the mass as respects agitation?

A. It don't agitate the mass at all, just smooths or levels down the top.

J. H. JOHNSON.

A. B. FASSETT, called as a witness on behalf of the defendants, and after being duly sworn testified as follows:

DIRECT-EXAMINATION BY MR. STEARNS:

Q. State your age, residence and occupation.

A. I live in Portland, Oregon, and am superintendent of the Warren Construction Company.

Q. How long have you been with that company?

A. Nine years, since 1903.

Q. And during that time have you had experience in laying pavement, and if so what kind?

A. Yes, bitulithic and asphalt.

Q. Will you describe the process of laying bitulithic pavement when you first began work for the Warren Construction Company?

Counsel for complainant objects to the question as immaterial.

A. The street is graded out to six-inch grade, and that is covered with a four-inch crushed rock base. The rock is put on graded, rolled and then coated. We don't put the roller on again after the bitulithic cement is put on top. It is not rolled after the top coat is put on. The top coat of crushed rock two inches thick is put on the four-inch base, and that is rolled, and then the coating on top of that.

Q. Was that the process you used when you began laying that pavement?

A. Yes, the same process is used now as was used then.

Q. In preparing the sub-grade is it rolled?

A. Yes.

Q. How heavy a roller?

A. Ten ton.

Q. I think you have already stated that the rock was compressed by rolling?

A. It is.

Q. What size roller do you use for that?

A. Ten tons. We use the same roller.

Q. Mr. Fassett, what has been your experience either from observation or actual work in rolling a rock base that has been wet?

A. It is much more difficult to roll than dry rock. In fact it is almost impossible to roll and get a good surface on a thoroughly wet base.

Q. What kind of a roller do you mean in your last answer?

A. I mean with the same kind of a roller. It would be easier to roll with a lighter roller than with a heavier roller.

Q. What has been your experience and observation as to the agitation of the base after it has been thoroughly rolled with a ten-ton roller if a five-ton roller should be run over it?

A. I don't know that I understand the word "agitation" thoroughly. If you mean compression I should think there would be practically none with a five-ton roller after a ten-ton roller had been over it. I would

say that if it had been thoroughly rolled once with a ten-ton roller a five-ton roller would have no effect upon it.

Q. Would it cause any movement in the mass except on the surface?

A. No, sir; I should say none if it had a good foundation.

No cross-examination.

A. B. FASSETT.

J. M. HARTONG, called as a witness for the defendants and after being duly sworn testified as follows:

DIRECT-EXAMINATION BY MR. STEARNS:

Q. Do you reside in Portland, Oregon?

A. Yes.

Q. What is your occupation?

A. Superintendent for Elwood Wiles, of his paving department.

Q. How long have you been engaged in laying pavements?

A. For the last five years.

Q. What kind of pavements have you been laying?

A. I have laid all sorts.

Q. Have you had any experience in rolling crushed stone for pavements?

A. Yes.

Q. How long have you had such experience?

A. About four years.

Q. State what your experience has been with respect to rolling a bed of broken stone after it has been thoroughly compacted with a ten-ton roller and wet?

A. I have always found it practically impossible

to get over a wet rock base with a ten-ton roller, and we have found it necessary to use plank or boards of some kind to get over it.

Q. What sort of roller do you use after the base has been rolled with a ten-ton roller in Hassam pavement?

A. We use a five-ton roller then.

Q. What is your opinion based upon your experience and observation as to the agitation or movement of the mass by a five-ton roller after it has been thoroughly compacted with a ten-ton roller?

A. I would say there would be no perceptible movement.

CROSS-EXAMINATION BY JUDGE CAREY:

Q. You speak about being superintendent for Elwood Wiles—do you mean the Consolidated Contract Company?

A. No, sir.

Q. What relation has Elwood Wiles to the Consolidated Contract Company?

A. None whatever that I know of in the actual construction operations. I think he is vice-president but I know nothing at all about the operating end of that company.

Q. You are not employed by the Consolidated Contract Company?

A. No, sir.

Q. Does Elwood Wiles attend to the operations of the Consolidated Contract Company?

A. Not that I know of. He possibly takes an

interest in their work but of course I know nothing about that end of it at all.

Q. What kind of pavement have you laid in 1912?

A. Bitulithic and westrumite.

Q. Have you laid any Hassam?

A. No.

Q. What kind in 1911 and 1910?

A. 1911 bitulithic only, and 1910 asphalt only.

J. M. HARTONG.

PORTLAND, Oregon, December 18, 1912.

Parties met pursuant to adjournment.

Present, Mr. JESSE STEARNS and Judge CAREY.

Mr. Stearns: I offer in evidence the following publication, being the printed report of the City Surveyor of Rochester, New York, to the Executive Board of the said city for the year ending April 4, 1894, addressed to the Honorable, the Executive Board of the City of Rochester, and purporting to be signed by J. Y. McClintock, City Surveyor, dated Rochester, June 1, 1894, the particular part of said report I wish to refer to being found on page five of the said pamphlet, entitled "Concrete Pavement."

Judge Carey: I object to the admissibility of the exhibit offered on the ground that it is irrelevant and immaterial; but I do not object to the form or manner of proof.

The pamphlet referred to was thereupon offered and the same was thereupon marked Defendants' Exhibit "J," and the pamphlet was by the

agreement of counsel left in the custody of the defendants' counsel until the hearing.

Mr. Stearns thereupon read the said portion of the pamphlet offered in evidence into the record as follows:

“CONCRETE PAVEMENT: There are many miles of streets where a cheap pavement is requisite, and where macadam with trap rock would be suitable except that it seems desirable to get rid of the small amount of mud which is usually present, and to have a surface that can be washed off clean. To meet this requirement we tried in 1893 the following on South Fitzhugh street north of the canal. The surface of an existing macadam pavement was picked off and a layer of trap rock, six inches thick in the middle and two inches thick at edge of paved gutters, was put on and thoroughly rolled with a steam roller. After this was done, instead of putting on a binding material and rolling that in as usual, Portland cement grout, one of sand to one of cement, mixed to the consistency of cream was carefully poured in so as to fill all the voids between the broken stone and formed a solid matrix to hold each stone firmly in position. The stone was thoroughly wet just before pouring in the grout. One barrel of cement was used to each $8 \frac{7}{10}$ square yards of pavement. After the mortar had set for twenty-four hours, sand was thrown over the surface and water sprinkled upon it, and all travel was kept off it for nine days. This has been down eight months and already shows that the size of stone used was too small; it would all pass through a one and one-half inch ring. The stones are so small that the calk of a horseshoe throws out bodily a stone sometimes. I believe it will be

well to try this again with stones which will pass a three-inch ring and will not pass a two-inch ring. The cost of this pavement was one dollar per square yard.”

Thereupon counsel for defendants gave notice that they will take the deposition of J. Y. McClintock of Rochester, New York, on written interrogatories to be submitted to plaintiff's counsel for cross-interrogatories, and that the said deposition will be taken thereunder according to the practice of this court, and for the purpose of taking said deposition and having the same returned, asked for an adjournment until January 21, 1913, at which time the defendants expect to be able to close their case.

Thereupon an adjournment was taken until January 21, 1913, at the hour of ten o'clock A. M.

PORTLAND, OREGON, January 21, 1913.

Pursuant to adjournment the parties met and on account of inability to get the witness to attend at this time the hearing was adjourned until February 8, 1913, at 11 o'clock, A. M., at which time the parties as heretofore were present, and the following testimony was taken:

GEORGE W. GORDON, recalled, as a witness for the defendants herein, and was examined and testified as follows:

DIRECT-EXAMINATION BY MR. STEARNS:

Q. You have been a witness on this hearing before?

A. I have.

Q. Since you were a witness here you have made some statements to me about some work you did in Detroit, will you tell what that work was and when it was done?

A. I was building a house there, about a block and a half north of Woodward Avenue and west of the river, for Henry Engelbert, architect; it was a brick house, and Handler Brothers were the contractors for the brickwork, and I put this very same kind of what is called grout in the concrete basement of that house.

Q. Describe how you did that?

A. They gave us the privilege sometimes in concrete work of taking the old broken brick and stone and breaking them up and using them for concrete work, and we used them in this basement, and after breaking them up we took sand and cement and made a grout and poured it on there, just exactly the same kind of grout that is used now. The broken stone and brick were spread on the basement floor and leveled up after the basement floor was got to the proper grade; they would put down the stakes to get the thickness and after we got the thickness we took the stakes out and poured in the grouted cement.

Q. How was this grout made?

A. Mixed sand and cement together with water and poured it on, and we took a tamper and tamped it well, and we used about equal quantities of sand and cement. It was an ordinary thing to use that sort of grout then and I never thought anything of doing it.

Q. This broken stone and brick covered the whole basement and over that you poured the sand, cement and water mixed together, as you have described?

A. Yes, that is a regular concrete floor.

Q. It extended over the whole basement?

A. Yes, over the whole basement.

Q. When was this?

A. About thirty-two years ago, as near as I can recollect.

Q. Can you remember during what time you lived in Detroit?

A. Yes, I lived there for fifteen years.

Q. Between what periods?

A. I have been here twenty-two years.

Q. Was it before that that you lived in Detroit?

A. Yes, I came direct from there here and have been here twenty-two years.

Q. And this work you have referred to was done while you were living in Detroit?

A. Yes.

Q. Do you recall any other instances in which you laid concrete in the same way?

A. I don't recall any in particular. It was such a common occurrence that I paid no particular attention to it being done. We would take this broken up brick and stone if the architects would let us do that, sometimes there would be an architect who was more particular than others and we could not use it then, but in this case I spoke of they let us use that.

Q. Do you recall any other basements or sidewalks that you did yourself or had anything to do with the laying of where this same combination was used?

A. As I say I never paid any particular attention to it, and I cannot think of any right now. I happened to think of this particular case and told you about it.

Q. You did not mention this to me until after the time you were on the witness stand before?

A. No, it was after that.

Q. Do you remember anything else that would be pertinent to this hearing or this matter?

A. I cannot think of anything else right now. That sort of thing was being done right along, as I say, and I never paid any particular attention to it. It was nothing unusual when we laid that basement in that house that I have told you about.

No cross-examination.

GEORGE W. GORDON.

Mr. Stearns: I have a little further documentary evidence which I wish to introduce at this time.

Judge Carey: Very well, what is it?

Mr. Stearns: It is all taken from this book. The book is not mine, but if I can get possession of it or one like it I will produce it at the hearing, but now wish to identify the portions I wish to introduce.

Judge Carey: Why don't you read the portions into the record?

Mr. Stearns: I will do that. These quotations are taken from a volume entitled "SPECIAL CONSULAR REPORTS. STREETS AND HIGHWAYS IN FOREIGN COUNTRIES. Reports from the Consuls of the United States on streets and highways in their several districts, in answer to a circular from the Department of State. Issued from the Bureau of Statistics, Department of State. 1891. Government Printing office, Washington." I wish to introduce that portion of the report found on page 214 of this book, the same being

a portion of United States Consul Herbert W. Bowen, Barcelona, January 10, 1891, reading as follows:

“At present several new kinds of pavement are being laid and tested. One kind is an artificial cement pavement, which consists of a hydraulic plaster from 10 to 12 centimetres thick, on which is laid a cover of Portland cement from 4 to 5 centimetres deep, mixed with coarse sand, and then rigidly rolled and compressed. The durability of this pavement is said to be great, and it is well adapted for the use of carriages and bicycles.”

I also wish to read into the record a portion of the report of Consul George Gifford, on city streets, Canton, found on page 239 of the same book, as follows: “Macadamized streets are laid on a limestone foundation six inches deep over which is a layer of broken stone rolled down with cement.”

I also wish to introduce and read into the record a portion of the report on streets and sewers of Liverpool, by Consul Thomas H. Sherman, found on page 344 of the same book, as follows:

“SECOND CLASS STREETS: Excavate or fill in the ground as the case may be, to the requisite level, and remove all surplus material; properly form and trim off the surface; and thoroughly consolidate the same, and then lay a foundation of (a) not less than six inches of Portland cement concrete, corporation standard, or (b) not less than six inches of bituminous concrete, consisting of clean and angular broken stone, grouted with hot asphalt, com-

posed of coal pitch and creosote oil, covered with chippings, and thoroughly consolidated by rolling with a roller of sufficient weight."

I also wish to introduce and read into the record a portion of the report of Consul L. W. Brown, Glasgow, found on pages 423 and 424 of the same book, as follows :

"**BOTTOMING.** After the ground has been carefully prepared to the required sections, a bed of the best whinstone metal, 6 inches in depth, broken to pass through a 2-inch ring, shall then be laid over the whole surface of the roadway, be thoroughly grouted with a mixture of the best British bitumen and pitch oil, and thoroughly beaten with a rammer while being grouted, the finished surface to be perfectly smooth. The whinstone metal must be thoroughly dry before being grouted with bitumen." (Page 423.)

"**GROUTING:** Cement grouting to be composed of one measure of best Portland cement to two measures of clean sharp river sand, all properly mixed."

To the introduction of the above quotations counsel for plaintiffs objected as immaterial.

IN THE
DISTRICT COURT OF THE UNITED STATES,
FOR THE DISTRICT OF OREGON.

HASSAM PAVING COMPANY, a
corporation, and OREGON HAS-
SAM PAVING COMPANY, a cor-
poration,

Complainants,

vs.

CONSOLIDATED CONTRACT COM-
PANY, a corporation, and
PACIFIC COAST CASUALTY COM-
PANY, a corporation,

Defendants.

IN EQUITY
STIPULATION TO
TAKE
DEPOSITION.

IT IS HEREBY STIPULATED AND AGREED by and be-
tween the parties to the above entitled suit, that a com-
mission may be issued by the Clerk of the above en-
titled Court to Erwin S. Plumb, a Notary Public,
having his office in the City of Rochester, New York,
as Commissioner to take the deposition of J. Y. Mc-
Clintock, a witness on behalf of defendants, residing
in the City of Rochester, and State of New York, upon
written interrogatories, direct and cross, and directing
the said Commissioner to take said testimony in accord-
ance with the law and practice in such cases, and to
attach his certificate to the deposition when so taken,

and return the same forthwith, under his seal, to the Clerk of said Court.

IT IS FURTHER STIPULATED that the deposition of said witness shall be taken upon direct-interrogatories, on behalf of defendants, hereto annexed, and that cross-interrogatories on behalf of complainants, shall be delivered to the Clerk, and served upon counsel for defendants within days from the date hereof, otherwise the deposition shall be taken upon the direct-interrogatories of defendants only; and that the testimony taken as aforesaid shall be subject to the same objections as to competency, relevancy and materiality, as though said witness were present in Court and testifying; that the deposition when returned to the Clerk may be opened and examined by counsel for either party without notice to the other, and may be read by either party upon the hearing and trial of this cause.

CAREY & KERR,

Solicitors for Complainants.

JESSE STEARNS & JOHN H. HALL,

Solicitors for Defendants.

IN THE
DISTRICT COURT OF THE UNITED STATES
FOR THE DISTRICT OF OREGON.

In Equity.

HASSAM PAVING COMPANY, a corporation, and OREGON HASSAM PAVING COMPANY, a corporation,

Complainants,

vs.

CONSOLIDATED CONTRACT COMPANY, a corporation, and PACIFIC COAST CASUALTY COMPANY, a corporation,

Defendants.

WESTERN DIST. OF NEW YORK, }
County of Monroe, } ss.:
City of Rochester, }

J. Y. McCLINTOCK, a witness called on behalf of the defendants herein, and residing at Rochester, New York, more than one hundred miles from the place where this cause is to be tried, being cautioned and sworn to tell the whole truth, and being carefully examined deposes and says as follows:

First Interrogatory: State your age, residence and occupation.

Answer: 60 years old. Rochester, N. Y., Civil Engineer.

Second Interrogatory: What was your occupation in 1893?

Answer: City Surveyor of Rochester, N. Y.

Third Interrogatory:—If in answer to the last interrogatory you shall state that you were City Surveyor of the City of Rochester, New York, state whether or not you prepared the original report, a printed copy of which is herewith shown you, marked Defendant's Exhibit "J."

Answer: I prepared the original report marked Defendant's Exhibit "J."

Fourth Interrogatory: If in answer to the third interrogatory you shall answer that you did prepare such report, state when such report, Defendant's Exhibit "J" was printed.

Answer: In 1894.

Fifth Interrogatory: If you shall answer that Defendant's Exhibit "J" is a printed copy of your report to the Executive Board of the City of Rochester, New York, for the year ending April 1st, 1894, state whether or not the same was printed under your supervision, and how many copies of said report were printed at that time, if you know.

Answer: It was printed under my supervision and probably one or two thousand copies were issued.

Sixth Interrogatory: If in answer to the last interrogatory you shall state that more than one copy of said report was printed state if you know what was done with such printed copies.

Answer: Copies were sent to engineers, highway officials in nearly every city in the country. One or two copies were filed in the library of the American Society of Engineers and to the city officials of the City of Rochester.

Seventh Interrogatory: If in answer to the last interrogatory you shall state that some of them were distributed to the City officials of the City of Rochester, and to the public, and some were lodged in the offices of the City officials of the City of Rochester, state in what offices some of said copies were lodged, and whether or not you have in your possession a copy of said report.

Answer: There should be some copies now in the office of the Commissioner of Public Works of the City of Rochester or the office of the City Engineer. I have a copy in my possession.

Eighth Interrogatory: Read the paragraph on page 5 of Defendant's Exhibit "J," under the heading "Concrete Pavement," and that whether or not all the facts stated in that paragraph are true of your knowledge.

Answer: All of the facts there stated, are true.

Ninth Interrogatory: If in answer to the last interrogatory you shall state that said facts are true, state how long the pavement described as having been laid on South Fitzhugh Street, north of the Canal, in 1893, remained in use.

Answer: At least four years, and probably five.

Tenth Interrogatory: State of your own knowledge, whether or not any concrete pavement described on page 5 of Defendant's Exhibit "J" or similar pave-

ment, has been laid on any other Streets in the City of Rochester, or elsewhere, since 1893.

Answer: I do not know.

Eleventh Interrogatory: If you shall answer to the last interrogatory that such pavement has been laid on other Streets in the City of Rochester, or in any other city or place, of your knowledge, state when the same was laid, how much, and describe fully the process of laying it.

Answer: I do not know.

Twelfth Interrogatory: State what experience you had prior to 1893 in constructing roads and pavements.

Answer: I have practiced civil engineering since 1869 and up to 1880, was employed on general engineering work, and especially railroad work, and during the time, was for a number of years Chief Engineer of the old original Boston & Maine R. R. and was familiar with the construction of pavements around stations and station yards. I was also familiar later with the experience of the Massachusetts Highway Commission in its early studies, during which time my brother, W. E. McClintock, was a member of that Commission.

Thirteenth Interrogatory: State at whose suggestion the method of laying the concrete pavement described on page 5 of Defendant's Exhibit "J" was used; and state the details in regard to the adoption of the method of laying such pavement as fully as you can remember.

Answer: As far as I know the proposition originated with myself. The impelling consideration came from the fact that I had recently become City Surveyor

and macadam pavements had become so unpopular that it required a vote of fifteen out of sixteen aldermen to pass an ordinance for such pavement in the City of Rochester, because many miles of such pavement had been built here with soft local stone which would usually wear out so as to be scraped off by the Highway Department the following year. I was familiar with what was being accomplished in New Jersey and Massachusetts in the use of trap rock and so making a successful macadam road. Being familiar with the use of cement and being impressed by the possibilities of using Portland cement which then had first been reduced to a price warranting its use in highway construction, it was very natural that I should try it as described. I made a communication to the Board of Aldermen discussing the subject and emphasizing the importance of trying it and asking them to allow me to try it experimentally in the manner described so that all of us could have the benefit of such experiment.

Fourteenth Interrogatory: Do you know, or can you set forth, any other matter or thing which may be of benefit or advantage to the parties at issue in this cause, or either of them, or that may be material to the subject of this, your examination, or the matters in question in this cause? If yea, set forth the same fully and at large in your answer.

Answer: The piece of pavement laid, developed irregular temperature cracks and on one portion of it where the hacks stood in the shade of the court house, the horses would drill holes with their feet in kicking

off flies, etc., so that it soon became a question of how the pavement could be maintained. It was some two and a half years after the pavement was laid, when I left the office of the City Engineer, as it had then become, and as I understand it, some two years after that, when an overhead bridge crossing the canal in the vicinity of such pavement was replaced by a lift bridge and the approaching grades were reduced, it was deemed wise by the city authorities then to cover the new portion of roadway with asphalt, and at that time they also pulled out this short section of cement and substituted therefor asphalt.

Cross-interrogatory one: Referring to the report of the City Surveyor, to which your attention has been directed, the concrete pavement which was tried in 1893 on South Fitzhugh Street, in Rochester, New York, was in the nature of an experiment. Is this correct?

Answer: Yes.

Cross-interrogatory two: The pavement referred to in cross-interrogatory one practically had reference to the resurfacing of a small section of a street, and not to the preparation of a foundation. Is this correct?

Answer: Yes.

Cross-interrogatory three: In applying the layer of trap rock, referred to in said report, was the original foundation left in the street?

Answer: Yes.

Cross-interrogatory four: What was the nature of said original foundation?

Answer: From my information, it was local stone laid in the form known as "telford," that is, it was flat stones set on edge and wedged together, as distinguished from macadam where the stones are broken up into small fragments.

Cross-interrogatory five: How thick was this original foundation?

Answer: From my information it was from one to two feet thick.

Cross-interrogatory six: Was this original foundation removed in applying the layer of trap rock referred to on page five of said report?

Answer: No, it was not.

Cross-interrogatory seven: In this report, this statement is made, "This has been down eight months and already shows that the size of the stone used was too small." Please explain this more fully.

Answer: After eight months' use the horses' calks were picking out some of the individual stones and I became doubtful as to the advisability of going further with it until further experimenting or experience with it. Later temperature cracks developed.

Cross-interrogatory eight: What did the laying of the pavement referred to on page five of said report demonstrate to you?

Answer: It demonstrated that I might have something of practical value, but that I had not carried it far enough or experimented enough at length to demonstrate its practical value.

Cross-interrogatory nine: Did you ever make any effort to introduce or try this pavement anywhere

else except in 1893 on Fitzhugh Street in Rochester,
New York?

Answer: No.

J. Y. McCLINTOCK.

Subscribed and sworn to before me }
this 25th day of March, 1913, }

ERWIN S. PLUMB,
Notary Public.

IN THE
DISTRICT COURT OF THE UNITED STATES
FOR THE DISTRICT OF OREGON.

In Equity.

HASSAM PAVING COMPANY, a
corporation, and OREGON HAS-
SAM PAVING COMPANY, a cor-
poration,

Complainants,

vs.

CONSOLIDATED CONTRACT COM-
PANY, a corporation, and PA-
CIFIC COAST CASUALTY COM-
PANY, a corporation,

Defendants.

WESTERN DISTRICT OF NEW YORK, }
County of Monroe, } ss.:
City of Rochester, }

I hereby certify that on the 25th day of March, 1913, before me, ERWIN S. PLUMB, a notary public in and for the County of Monroe and State of New York, at my office, No. 613 Wilder Building, in the City of Rochester, County of Monroe, and State of New York, personally appeared, pursuant to the notice hereto annexed, between the hours of ten o'clock in the morning, and five o'clock in the afternoon, J. Y. McClintock, the witness named in said notice and there was no appear-

ance for either the plaintiffs or the defendants, and the said J. Y. McClintock being by me first duly cautioned and sworn to tell the whole truth, and being carefully examined, deposed and said as appears by the deposition hereto annexed. And I further certify that the said deposition was then and there reduced to typewriting under my personal supervision and was, after it had been so reduced to typewriting subscribed by the witness in my presence, and same has been retained by me for the purpose of sealing up and directing the same to the clerk of the Court as required by law.

I further certify that the reason why the said deposition was taken was that said witness resides at Rochester, New York, more than one hundred miles from Portland, Oregon, where this cause is to be tried.

And I further certify that I am not of counsel or attorney to either of the parties, nor am I interested in the event of the cause.

And I further certify that my fee for taking said deposition is Fifteen Dollars and that the same is just and reasonable.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal at the City of Rochester, in the County of Monroe and State of New York, this 25th day of March, A. D. 1913.

(Signed) ERWIN S. PLUMB,
Notary Public.

DISTRICT COURT OF THE UNITED STATES,

DISTRICT OF OREGON.

In Equity.

HASSAM PAVING COMPANY, a corporation, and OREGON HASSAM PAVING COMPANY, a corporation,

Complainants,

vs.

CONSOLIDATED CONTRACT COMPANY, a corporation, and PACIFIC COAST CASUALTY COMPANY, a corporation,

Defendants.

REBUTTAL PROOFS ON BEHALF OF
COMPLAINANT.

WORCESTER, MASS., Sept. 15, 1913.

Met pursuant to notice at the offices of Southgate & Southgate, 25 Foster Street, Worcester, Mass.

Present—LOUIS W. SOUTHGATE, ESQ., for Complainants, JOHN H. HALL, ESQ., for Defendants.

Adjourned by agreement until Tuesday, Sept. 16, 1913, at same place, at 10:30 A. M.

WORCESTER, Mass., Sept. 16, 1913.

Met pursuant to the above-adjourned adjournment.

Present—Counsel as before.

ARTHUR S. BROWNE, a witness called on behalf of complainants, being duly sworn, testifies as follows:

DIRECT-EXAMINATION BY COUNSEL FOR COMPLAINANTS:

Q. 1. Are you the Arthur S. Browne who has already been sworn in this case, and who has testified for complainants?

A. I am.

Q. 2. Have you read the proofs taken on behalf of defendants and examined the exhibits offered in evidence?

A. I have.

Q. 3. Do you find in any of the prior patents or publications offered in evidence by defendants the subject matter of the claims of the three Hassam patents referred to in your former deposition, and please give reasons for your answer?

A. I do not find in any of the prior patents or publications offered in evidence on behalf of the defendants the subject matter of any one of the claims of the three Hassam patents to which I referred in my former testimony.

No one of the prior patents or publications discloses a pavement consisting of hard-rolled uncoated stone and a grouting of cement filling the voids or spaces between the stones, upon which foundation a wearing surface is placed. This is the subject matter of claim one of the first Hassam patent, 819,652.

No one of the prior patents or publications discloses a process of constructing a road or pavement which consists in first laying a foundation of hard-rolled uncoated stone and filling the voids between the stones by a grouting of cement, sand and water, and agitating the mass of stone and grouting so as to expel the air from between the stones and fill the voids with the grouting, a wearing surface being placed on the foundation thus prepared. This constitutes the subject matter of claim 2 of the second Hassam patent, 851,625.

No one of the prior patents or publications discloses a road, pavement or other artificial structure comprising a foundation of hard-rolled stone having a grouting of cement placed thereupon and filling all the voids therein, and a top layer of small uncoated stones pressed into the surface of the grouting before it sets, or a process for laying such a pavement. This constitutes the subject matter of the several claims of the third Hassam patent, No. 861,650.

Before considering in detail the prior patents and publications, I wish to emphasize certain characteristics of the Hassam patents.

In accordance with all three Hassam patents a foundation layer of stone is hard-rolled, so as to reduce the voids to a minimum, thus economizing the grouting, which is the more expensive ingredient. The application of the fluid grouting to the concrete surface makes the mass moist, so that it is readily disturbed by pressure; and being then agitated by rolling the foundation stones are loosened sufficiently to enable the

grouting while still fluid to penetrate between the stones and fill all the voids expelling the air. The result is that a solid foundation is obtained in which the stones are securely cemented together by the cement and the cement and sand occupy all of the spaces between the stones. Substantially a monolithic pavement is produced, approximating the solidity of solid rock. Upon this foundation a wearing surface is placed.

In accordance with the third Hassam patent a foundation is prepared as in the first and second Hassam patents, excepting that the grouting is supplied in such ample quantity as not only to fill all of the voids in the foundation, but to overflow. Onto this overflowing grouting while it is still green or fluid, a surface layer of fine stone is placed and rolled so that the surface layer is bound to the foundation by the grouting. Thus a durable wearing surface is obtained.

No such pavement is disclosed in any of the prior patents or publications in evidence.

I will first consider the prior patents.

PRIOR PATENTS.

Murphy 238,706, March 8, 1881. The pavement of this patent is made as follows:

(1) A layer of broken stone or slag is spread to the depth of about six inches. There is no hard rolling of the stone after it is first spread and before anything else is done.

(2) A grout is then applied which is not like the grout of cement, sand and water used in making the

Hassam pavement. The grout that Murphy employs is thus described by him:

“Lime, ground or slaked (blue lias preferred), twenty per centum; sand, clean and pure, thirty per centum; iron slag or furnace cinders, twenty-five per centum; Portland cement ten per centum; silica, or oxide of iron, ten per centum; cast-iron filings, sulphur, etc., five per centum” (Lines 57 to 64).

(3) *After* the grout has been applied the grouted foundations rolled. This is just opposite to a Hassam pavement. Hassam rolls his foundation of stone so that the voids are reduced to a minimum before the grouting is applied, thus economizing in grout; whereas Murphy applies his grout to the foundation before the rolling takes place, hence requiring an excessive amount of the grout in case it is sufficient to fill all of the voids.

(4) Upon this foundation a layer of pulverized slag and lime mixed with sand (line 35) well saturated with water (line 66) is deposited.

(5) Upon this layer stone blocks are laid in courses to break joints.

(6) The interstices between the stone blocks are partially filled with grout, apparently the same grout as is used with the foundation.

(7) “Clean screenings” (line 43) are then spread over the stone surface until the interstices are filled or

nearly so. This filling is then packed or pressed until it has a depth of one or two inches over the grout.

(8) The blocks of stone are then rammed.

(9) The interstices between the stones are then filled to the top with grouting (apparently of the same composition as used in the foundation), thus making a level surface.

(10) Finally a coating of sand is spread upon the surface.

Obviously, this Murphy pavement and the method of making it bear no resemblance to the Hassam pavement and method.

In Murphy, there is no preliminary hard rolling of the stone foundation before the grouting is applied; there is no grouting whose ingredients are simply cement and sand; there is no agitation or disturbance of the previously hard-rolled stone foundation to insure the grouting flowing into all of the voids and expelling the air; and there is no continuous grouting occupying the voids between the foundation stones and serving to bind the surface layer of small stones to the foundation.

Bayard 381,667, April 24, 1888. It should be sufficient to say about this patent that it does not use a grouting whose ingredients are cement and sand. The pavement of this Bayard patent is made as follows:

(1) The foundation consists of broken stone and ashes or pebbles which is rolled until thoroughly settled.

(2) A second layer is then laid consisting of broken stone, cinders and pebbles mixed with tar. This second layer is from three to four inches thick and it is thoroughly rolled.

(3) Then a third layer from one-half to two inches thick is laid consisting of sand or ashes, small pebbles and coal tar well mixed together. This third layer is consolidated by rolling and its surface is rendered as smooth as possible.

(4) Over this third layer is spread a filling coat consisting of coal tar, resin, and unslacked lime, well mixed together and boiled. This mixture is poured upon the pavement so as to fill all the holes and interstices, and the pouring is continued until no more of the mixture will be absorbed.

(5) "Ordinary surface cement, as Portland, or its equivalent, is now spread over the surface and it is again rolled" (line 43).

(6) Finally fine sand is spread over the surface.

Obviously, this patent and its method of construction bears no resemblance to the Hassam pavement. No grouting is used at all. On the contrary, the interstices are filled with a boiled mixture of coal tar, resin and unslacked lime. As no grouting is employed, it necessarily follows that there is no previously hard-rolled stone foundation, whose small voids are filled with grouting which continues above the surface of

the foundation so as to bind the surface layer of small stones embedded therein to the stone foundation.

Hagerty 413,278, Oct. 22, 1889. The pavement of this patent is made as follows:—

(1) First, either coarse rubble is laid or stone blocks are evenly laid. There is no rolling.

(2) A top coating of a thin grout prepared with sand and cement is applied. There is no rolling. This grout is a mere coating. It is not described as sufficient to fill the voids in case the coarse rubble is employed.

(3) The grout coated road-bed when dry is then coated by washing with hot pitch tar all over the surface. The specification says (line 87), that this washing is not essential in case the surfacing material used has sufficient volatile carbonaceous matter to cause it to adhere without this coating.

(4) Upon this foundation slabs of bituminous sandstone or other concrete asphaltum compounds of a uniform thickness are laid.

(5) "Slabs thus prepared are laid upon a road-bed or sidewalk previously described as close as practicable, and by means of a heavy heated roller are pressed, so that by the heat and pressure applied the edges are caused to unite and the under side to adhere to the pitch-tar coating, thus forming a level homogeneous mass." (Page 1, lines 74 to 81.)

This Hagerty pavement and method bear no resemblance to the Hassam pavement and method. In

Hagerty, there is no preliminary hard rolling of the broken stone foundation; there is no filling of the voids between the stones by the grout; there is no agitation or disturbance of the previously hard rolled stone while the applied grout is still fluid to insure the filling of the voids by the grout with the expulsion of air; and no overflowing of the grout in which the surface layer of fine stones is embedded and by which such surface layer is united to the foundation.

Warren 675,430, June 4, 1901. No grouting is used in the pavement of this patent, and hence it cannot disclose the subject matter of any of the Hassam claims. The Warren pavement is made as follows:

(1) "The foundation layer or stone may be of the macadam order or the Telford arrangement, or a combination of the two, and it is laid in the usual way." (Page 1, line 52).

(2) On this foundation "is arranged the layer D of smaller stone, which preferably are coated or partly coated with coal tar, coal tar pitch, asphalt, or a mixture of them or other equivalent bituminous material" (page 1, line 55). This layer "is thoroughly rolled and will, when laid, furnish a surface which is coarse and of a constituency which is more or less cellular in character" (page 1, line 63).

(3) Upon the prepared surface is then thoroughly rolled a heavy layer of specially prepared ingredients. Concerning this layer the specification says:—

"It is composed of a mixture of relatively coarse particles one-half inch to three inches

in diameter, intermediate particles one-tenth inch to one-half inch in diameter, and fine particles (an impalpable powder), to one-tenth inch in diameter, suitably proportioned, graded, and thoroughly mixed, either hot or cold, with an incorporated composition of coal tar, coal-tar pitch, asphalt, or other equivalent bituminous material or a combination of them." (Page 1, lines 90 to 100).

(4) "The surface of the road-bed may or may not be covered with a thin coating of bituminous mixture of sand, gravel, screenings, or gravel mixed with coal-tar or other equivalent mixtures" (page 2, line 31).

As a modification, the specification says:—

"The concrete mixture which I have described may also be used as an intermediate or binder course between hydraulic-cement, concrete, bituminous-concrete, or broken-stone foundation and the wearing-surface of an ordinary asphalt pavement and is an improvement on binder courses previously used, for the reason that it forms a more solid and impervious binder course" (page 2, lines 80 to 89).

No grouting is employed. There is no preliminary hard-rolling of the foundation stone to make small voids which are filled by grouting; there is no agitation or disturbance of the previously rolled foundation stone while the applied grout is still fluid so as to insure the filling of all the voids and the expulsion of the air; and there is no overflowing above the surface of the foundation into which overflowing grouting the surface layer of small stone is embedded, and by means of which the surface layer is bound to the foundation.

PRIOR PUBLICATIONS.

(1889-1895)

Century Dictionary. This dictionary defines grout and macadamization. In the description of making a Macadam road there is no reference whatever to grout, much less a description of the Hassam pavement and process.

Practical Treatise on Limes, Hydraulic Cements and Mortars by Q. A. Gillmore (1874). No one of the extracts from this Treatise which have been read into the record on behalf of defendants describes a pavement or a process or method of making a pavement. It does describe the making of blocks of concrete.

On page 250, section 494, is described the making of blocks of concrete in the Harbor of New York in 1860, "by injecting a thin paste of light colored Rosendale Cement without sand, into boxes filled with coarse gravel and powders, and submerged in sea-water." No preliminary hard rolling of coarse gravel and pebbles is described; cement without sand was used; there was no rolling, agitation or disturbance of the previously rolled foundation after the grout had been applied to insure the filling of the voids; and there was no overflowing grout in which a surface layer of small stones were embedded, and by means of which such a surface layer was united to the foundation.

On page 262, section 515, a similar experiment is described. What I have just said with respect to section 494 applies to section 515.

Special Consular Reports. Streets and Highways in Foreign Countries (1891). The extracts from this book which have been read in the record on behalf of the defendants describe several pavements.

On page 214 of the Reports is thus described one kind of pavement:

“One kind is an artificial cement pavement, which consists of a hydraulic plaster from 10 to 12 centimetres thick, on which is laid a cover of Portland cement from 4 to 5 centimetres deep, mixed with coarse sand, and then rigidly rolled and compressed. The durability of this pavement is said to be great, and it is well adapted for the use of carriages and bicycles”.

This pavement bears no resemblance to the Hassan pavement and method. There is no foundation layer of broken stone which is hard rolled to reduce the voids to a minimum, the foundation being hydraulic plaster; there is no grouting which fills the voids in the foundation, but instead there is a “cover” of Portland cement and sand; there is no agitation or disturbance of a previously hard-rolled stone foundation, while the grout is still fluid so as to insure the filling of all of the voids and the expulsion of air; and there is no overflowing grout in which a surface layer of fine stones is embedded and by means of which such surface layer is united to the foundation.

On page 239 of this same book it is stated:

“Macadamized streets are laid on a limestone foundation six inches deep over which is a layer of broken stone rolled down with cement”.

This meagre description contains no suggestion of the Hassam characteristics which I have just enumerated.

On page 344 of this same book is described a foundation for a pavement of "not less than six inches of Portland cement concrete, corporation standard". No description is given of how the pavement is made or laid. Also in the same sentence is described a foundation of a "not less than six inches of bituminous concrete, consisting of clean and angular broken stone, grouted with hot asphalt, composed of coal pitch and creosote oil, covered with chippings, and thoroughly consolidated by rolling with a roller of sufficient weight". This pavement does not use a grouting of cement, but is a coal-tar pavement. There is no preliminary hard-rolling of foundation stone; no filling of the voids with grout; no agitation of the surface to insure thorough filling; and no overflowing grout on which a surface layer of fine stone is laid and by means of which such surface layer is united to the foundation, these features being characteristic of the Hassam pavement and process.

The final description of a pavement on page 423 under the title "Bottoming" has reference to a pavement in which the foundation consisting of "whinstone metal" is grouted with a mixture of bitumen and pitch oil. There is no preliminary rolling; no grout in which cement is an ingredient; no agitation to insure the filling of the voids in the previously rolled stone; and no overflowing layer of grout in which the surface layer of fine stone is laid, and by means of which such surface is united to the foundation.

Encyclopedia Britannica (1892). The extracts from this encyclopedia read into the record on behalf of the defendants after describing the roads of Ancient Rome, and the Telford and Macadam pavements, refers to "concrete and tar Macadam". The concrete Macadam is thus described:

"Concrete Macadam formed by grouting with lime or cement mortar, a coat of broken stone laid over a bed of stone previously well rolled, has been tried as an improvement on an ordinary Macadamized surface, but not hitherto with much success."

In accordance with this meagre description it is apparent that the grouting is not applied to the foundation bed of stone, but is simply used with the superimposed coating of broken stone. There is no description of how the grouting and the broken stone are incorporated with each other. So far as this description goes, it might be done in the manner referred to in the first Hassam patent, 819,652, where it says:

"Roads constructed of concrete or stone and cement mixed before they are laid also crumble and break up in time because the presence of the partly-hardened cement between the stone when the mixture is laid prevents the stone from being brought close together by compression, but causes comparatively large cement-filled voids to be left between said stone, and said cement soon disintegrates because it was necessarily disturbed in setting by the mixing operation" (Page 1, lines 26 to 37).

There is no suggestion in this Britannica article that the voids in the foundation are filled with the grout; or that the foundation is preliminarily rolled and the grout forced thereinto by agitation; or that the grout overflows the foundation and serves as the intermediary for uniting the surface layer to the foundation, thus lacking the salient characteristics of the Hassam pavement and process.

The Britannica article then describes a tar macadam pavement in which there is no grouting which contains cement, but a mixture of coal tar with creosote oil. This necessarily lacks the grouting employed by Hassam, and does not have the characteristics of the Hassam pavement and process to which I have just referred.

Rochester Pamphlet (1894), Defendants' Exhibit "J." The description of this pamphlet under the heading "Concrete Pavement" has been read into the record on behalf of the defendants. This describes not the making of a foundation for a pavement, but the making of the surface of a pavement. This description, after referring to the removal of the surface of an existing macadam pavement, says:

"* * * * * a layer of Trap rock 6 inches thick in the middle and 2 inches at edge of paved gutters was put on and thoroughly rolled with a steam roller. After this was done, instead of putting on a binding material and rolling that in as usual, Portland cement grout, one of sand to one of cement, mixed to the consistency of cream, was carefully poured in so as to fill the voids between the broken stone and form a solid

matrix to hold each stone firmly in position. The stone was thoroughly wet just before pouring the grout. One barrel of cement was used to each 8 7-10 square yard of pavement. After the mortar had set for 24 hours, sand was thrown over the surface and water was sprinkled upon it and all travel was kept off it for nine days. This has been down eight months and already shows that the size of stone used was too small; it would all pass through a one and one-half inch ring. The stones are so small that the calk of a horseshoe throws out bodily a stone sometimes."

This does not describe the pavement of the first Hassam patent, No. 819,652, because it relates solely to the surface of the pavement. Claim one of the first Hassam patent relates to a foundation upon which a surface is placed.

This description does not describe the process of claim two of the second Hassam patent, No. 851,625, because there is no description of agitating the stone after the grout has been applied and is still fluid, so as to insure the filling of the voids in the stones and expelling the air, which is characteristic of claim two of the second Hassam patent, and which also requires an additional surface.

Nor does it describe the road, pavement or artificial structure of the third Hassam patent, No. 861,650, or the pavement thereof, since that involves the grout overflowing the foundation, and the embedding therein of the surface layer of fine stone, thereby uniting the surface layer to the foundation.

Roads and Pavements, by Ira Osborne Baker (1904). The various sections of this book which have been read into the record on behalf of the defendants first describe the cementing or binding power of rock-dust, which is used between the coarser fragments of a stone road, the rollers employed, the way a broken stone road is rolled, the filling of the interstices between the stone, and applying material usually called the binder, and sometimes the filler, and the application of the binder or filler to the stone. All of this is contained in paragraphs 277, 278, 336, 341, 345 and 347, which say nothing about a grouting of which cement is an ingredient, and do not suggest the several characteristics of the Hassam pavement which I have heretofore emphasized.

Section 563 describes "bituminous concrete" involving a mixture of broken stone and tar substantially similar to what is described in the *Encyclopedia Britannica* to which I have already referred. This section, referring to a foundation of bituminous concrete, says that it is "more expensive and less reliable than hydraulic cement concrete." The same article refers to the employment of asphalt instead of coal tar, and states that "on account of the expense, asphaltum concrete is seldom used for a pavement foundation."

Section 695 refers to the use of asphalt as a binding material for crushed stone.

Section 696 describes "Warren's method." The method here described is substantially that of the War-

ren patent No. 675,430, June 4, 1901, which I have already discussed.

Section 697 describes "Whinery's Method." This describes a foundation of broken stone of hydraulic cement concrete, and a wearing coat of crushed stone and a mixture similar to that used for the wearing coat of sheet asphalt. The broken stone is heated to a temperature of about 300 degrees F., and a hot mixture of asphalt cement and mineral grains is spread over the top of the layer of the hot stone in a sufficient quantity to fill the voids in the stone and to level up the unevenness of the surface, the layer being properly graded with paving rakes. The operation is completed by the steam roller. This section says that no pavement of this kind has been constructed. Section 709 describes two ways of making tar macadam. In accordance with the first method "broken stone is mixed with sufficient tar more or less nearly to fill the voids, and then the mixture is deposited and compacted," the article stating "the process being very much the same as that employed in laying hydraulic cement concrete." In accordance with the second method "the broken stone is laid and rolled, and then a layer of tar is added and rolled, the intention being to force the tar into the interstices of the broken stone much as the stone binder is worked into a broken stone road."

Section 711 of this book refers to the preparation of the subgrade and to the making and laying of tar macadam.

Section 321 of this book describes the making of four-inch macadam roads at Bridgeport, Conn. Broken

stone was used and a binder of stone dust or siliceous sand, which was worked in until the voids in the crushed stone were practically filled, the stone being thoroughly consolidated with a steam roller of adequate weight.

None of the extracts of this book describe the Hassam pavement or method. There is no description of a foundation consisting of broken stone, rolled hard to reduce the voids to a minimum; or the filling of the voids with grout in which cement is an essential ingredient; no agitation of the previously rolled stone after the grout has been applied and is still wet, so as to completely fill the voids and expel the air; and no overflowing of the grout in which the surface layer of small stone is embedded and which unites such surface layer to the foundation.

These are all the prior patents and publications, and no one of them discloses the subject matter of the claims in controversy of the three Hassam patents in suit.

Adjourned until to-morrow, Wednesday, Sept. 17, 1913. Same place.

WORCESTER, Mass., Sept. 17, 1913.

Met pursuant to adjournment.

Present:—Counsel as before.

CROSS-EXAMINATION OF MR. BROWNE BY DEFENDANTS'
COUNSEL:

x-Q. 1. Mr. Browne, the patent that you have described as the first Hassam patent, 819,652, was originally intended as a foundation only upon which any kind of a wearing surface, such as brick, stone block, sheet asphalt, or other material, might be placed, was it not?

A. In part I agree with your statement. That is to say, the novelty lies in the foundation, although a super-imposed wearing surface is made an essential feature of the combination of claim 1.

x-Q. 2. What addition or improvement was made in the second patent, 851,625?

A. Agitating the previously rolled foundation after the grout had been applied and while it was still fluid, thereby filling all of the voids and expelling the air.

x-Q. 3. What is contained in the third patent, 861,650, that is not contained in the two prior patents that you have just referred to?

A. Using sufficient grouting so that it overflows or covers the foundation and embedding in this overflowing grouting while still wet a surface layer of fine stone, which are thereby united to the foundation.

x-Q. 4. What thickness of the fine stone you have just referred to, is to be applied?

A. The patent does not state in inches what the thickness of this surface layer is. The patent does say that the foundation may be six inches deep when rolled and assuming that this thickness of the foundation is illustrated in Fig. 2, the illustrated surface appears to be about one inch thick.

x-Q. 5. What do you understand to be the meaning of the word "grouting" or "grout"?

A. I agree with the Century Dictionary definition quoted in the record.

x-Q. 6. Then there was nothing new or novel in the making of a grout consisting of Portland cement, sand and water, was there?

A. No.

x-Q. 7. How long did you know, prior to the application for the first Hassam patent, was the process of grout by pouring in extra sand, cement and water upon broken rock, slag, or other material for the purpose of forming a concrete, been known or used?

A. At least as early as the Hagerty patent, 413,278, Oct. 22, 1889, which was about 16 years before the first Hassam patent. There may be earlier instances, but this is the earliest one shown by the publications and patents in evidence, and I have no earlier instance in mind.

x-Q. 8. The use of fine pea stone for the top surface or finishing of a road has been used for a great many years, has it not, dating back to the construction of Macadam and Telford pavements?

A. Yes.

x-Q. 9. You referred in your direct testimony to the "wearing surface" as applied to the Hassam pave-

ment. What part of this pavement do you allude to as the "wearing surface"?

A. In accordance with claim one of the first Hassam patent there is a "suitable surface" and the specification refers to brick, stone, or wood block, or fine broken stone or gravel. In speaking of this first Hassam patent I had reference to such surfaces when speaking of the "wearing surface."

Claim 2 of the second Hassam patent specifies placing "a surface" on the foundation and the specification says that any suitable surface may be used, but it prefers "to use another layer of grout on it, preferably thicker, with fine stone".

The third Hassam patent calls specifically for a surface of pea stone embedded in a continuation of the grouting which fills the voids of the foundation.

It is these several finishing surfaces to which I referred. Perhaps "finishing surface" would be a more appropriate term.

x-Q. 10. Mr. Browne, you stated in your first direct examination in this case, as I recall, that you were retained by the Hassam Paving Company as an expert upon patents?

A. Yes.

x-Q. 11. Do you still occupy that position?

A. Yes. I do not have a general retainer, but I am retained in this case, and have been retained in other cases for them.

Cross-examination closed.

ARTHUR S. BROWNE.

Prof. Arthur W. French, being called as a witness on behalf of complainants, and being first duly sworn, testified as follows:

DIRECT-EXAMINATION BY COUNSEL FOR COMPLAINANTS.

Q. 1. What is your name, age, residence and occupation?

A. Arthur W. French; age, 45; residence, Worcester, Mass.; occupation, Professor of Civil Engineering at the Worcester Polytechnic Institute.

Q. 2. Please state what, if any, experience you have had with concrete and the testing of the same?

A. I was graduated from the Thayer School of Civil Engineering of Dartmouth College, Hanover, N. H., in 1892. I followed the occupation of civil engineering three years thereafter and have had charge of many buildings and foundations in which concrete was used. In 1895 I went back to Dartmouth College as Assistant Professor of Civil Engineering. I was there three years. I then had a year in paper mill construction, in which concrete is largely used. I then came to Worcester Polytechnic Institute in 1889 and have since that date occupied the Chair of Civil Engineering. During the past fourteen years I have done a large amount of work as consulting engineer in concrete construction. I was superintendent for the contractors for the Harvard Stadium, which was built out of concrete. I have had charge of numerous engineering plants involving concrete, one of the largest being covering the canal at Lowell, Mass. I have

made a great many tests of concrete and a great many plans have been submitted to me for approval. The Building Department of Worcester employs me as expert to pass upon concrete buildings. I am familiar with the use of concrete in road work and have followed and examined the methods of making concrete roads for many years. I have testified as an expert in court on concrete construction.

Q. 3. Do you understand the ordinary method of making concrete roads, and, if so, will you please state what it is?

A. If the concrete is to be mixed by hand, the ordinary method employed is to put the desired amount of cement and sand on a mixing board. These may be mixed together dry, but more usually this mass is soaked with water and thoroughly mixed with shovels. Then the desired amount of crushed stone is added and the mixing is continued by shoveling until each piece of stone is coated as nearly as possible with cement, sand and water. Sometimes a machine mixer is employed in which the cement, sand, rock and water are put in together and then the ingredients mixed to get the same result, namely, as thoroughly as possible coating of the broken stone with mortar composed of cement, sand and water. The material prepared in this way is then shoveled on the road bed and given the desired grade and leveled. Sometimes it is simply spread and left on the road. In other instances it is tamped by workmen using hand tampers. I have never seen a steam roller employed for this purpose and believe great difficulty would be found in attempting such

a step, owing to the slippery, unstable condition of the mass. The mixture is allowed to stand in the roadbed the necessary length of time, usually a number of days, until it sets into a hard, so-called concrete.

Q. 4. Are you familiar as an engineer with the so-called "Hassam Process" of making a concrete road, and if so, will you please describe this process as you have seen it practiced?

A. I am familiar with the so-called "Hassam Process," and have seen the so-called Hassam roads constructed a number of times. As I understand this process, it is substantially as follows:

After the road is leveled or graded, naked, uncoated broken stone is spread upon the roadbed to a desired depth, say six inches; then a steam roller is passed over the naked stone to crush the same down so as to bring the crushed stone into as intimate contact as possible and to reduce the voids to a minimum. A steam roller can be run over naked or uncoated stone. Grout, which is a fluid, creamy mixture made up of cement, sand and water, is then poured over the crushed, naked bed of stone so as to fill up the interstices therein and a steam roller is passed over the grouted crushed stone so as to agitate the same and provide for perfect permeation of the grout into the stone bed. This can be easily done because the mass being in a pasty condition, the pieces of stone can rock or slip on each other so as to loosen up and allow the grout to pass down into the same. The steam roller can be passed over the slippery grouted rock, as it has been previously crushed and set mechanically by the

passage of the steam roller over the stone when it was in its naked condition. Pea stone is then usually sprinkled on top of the roadbed so that the grout will hold and lock the same and make a top wearing surface. This is also rolled. The roadbed is then allowed to stand until it solidifies.

Q. 5. Have you made tests to determine the relative strength of concrete such as is employed in road beds made by what you have described as the common or old method, and also by the Hassam method, and if so, will you please give the results of such tests.

A. At the request of the Hassam Paving Company I have conducted such tests. On May 10, 1913, ten beams were made under my direction in the yard of the Hassam Paving Company of Worcester. One-half of these specimens were made by the ordinary hand mixing method, tamping the concrete by hand tampers, and one-half of these specimens were made by the Hassam method, that is, rolling naked stone, grouting the same after rolling, and agitating the same with a roller during grouting. When the specimens were made by the old process I assisted and took part in the tamping myself and directed it so it would be as fair a test as was possible. The materials employed were the same for both sets of beams, namely, two-inch broken stone, ordinary bank sand, and Lehigh Portland cement. The Hassam specimens were made of grout made in the proportion of one part cement, one part sand and sufficient water to make the grout of a creamy consistency. The specimens made by hand had the voids of the stone filled with a mortar

composed of one part cement, two parts of sand, and water sufficient for a good mixing. Exactly the same quantity of cement entered into the five specimens made by the Hassam process as into the five specimens made by the hand process. The additional sand in the hand process was made necessary by the larger voids in those specimens. All specimens were kept covered and damp for twenty-seven days, when they were taken to the testing laboratory of the Worcester Polytechnic Institute in the molds. All beams were furnished with a hard plate through which the centering loading was applied.

The following is a tabulation of beam test:

TABULATION OF BEAM TESTS.

All beams tested with a center load on a span of 3 ft. 6 in.

A = Hassam beams. B = Hand mixed beams. Age, 30 days.

No.	Size of Cross Section	Ultimate load Center.	Bending stress per sq. in.
A1	12 x 6.5	3950	489
A2	12 x 6	3150	459
A3	12 x 6.25	4586	618
A4	12 x 5.75	3812	730
A5	12 x 6	1372	200 # Poor specimen.
Average of five		3374	499
Average of four		3874	574
B1	12 x 6	2840	414
B2	12 x 6.25	2980	401
B3	12 x 6	3230	471
B4	12 x 6.25	2747	370
B5	12 x 6.25	3173	426
Average of five		2994	416
" four best		3056	430
Comparison Hassam		574	= 133
Hand		430	100

Determination of specific gravity and unit weight.

Hassam sp. gr. = 2.63 Weight per cu. ft. = 164 lbs. 104

Hand mixed 2.53 158 " 100

This shows that the Hassam concrete was 33 per cent stronger to resist bending strain than the ordinary concrete. After the beams were broken in this manner, as many blocks as possible were cut out of the broken sections so as to make tests for compression or crushing. The following are the results of the tests made to resist compression:

Tests on Hassam and Hand-made Concrete Blocks.

No.	Age 3 months			Area sq. in.	First Crack Lbs.	Compression		Lbs. per sq. in.
	Size ins.					Ultimate Lbs.	Lbs. per sq. in.	
A1	4.5	x 6.0	x 4.0	27.0	24,040	890	218,700	8100
A2	5.0	x 5.7	x 4.8	28.8	121,700	4230	154,040	5358
A3	4.5	x 6.0	x 3.25	27.0	192,000	7110	236,080	8740
A4	3.87	x 5.5	x 4.0	21.3	84,660 #	3970	# 120,400	5658
A5	4.6	x 5.8	x 4.5	26.6	150,880	5670	180,520	6787
A6	4.6	x 5.35	x 4.5	24.6	110,940	4520	144,640	5880
A7	4.9	x 5.7	x 5.0	28.0	160,080	5710	190,060	6800
A8	5.37	x 6.	x 4.8	32.2	191,560	5950	223,540	6942
A9	4.9	x 5.7	x 4.5	28.1	168,700	6000	202,820	7218
A10	4.8	x 4.2	x 6.0	20.2	88,680	4400	95,600	4732
Average of ten						4845		6621
B1	4.0	x 6.0	x 4.5	24.0	109,780	4570	114,100	4754
B2	4.75	x 6.0	x 4.5	28.5	109,200	3820	125,340	4400
B3	4.9	x 6.2	x 5.0	30.4	89,840	2950	102,400	3370
B4	5.0	x 6.0	x 4.5	30.0	105,960	3530	140,800	4693
B5	5.4	x 6.0	x 4.5	32.4	100,100	3080	159,680	4930
B6	4.9	x 6.1	x 7.4	29.9	96,000	3210	104,080	3480
B7	5.0	x 6.26	x 4.5	31.2	126,800	4070	148,200	4742
B8	5.0	x 6.0	x 4.5	30.0	182,380	6040	203,440	6781
Average of eight						3910		4644

Poor Bed.

A signifies Hassam made blocks.

B " " Hand made blocks.

These show that the Hassam concrete was 42 per cent stronger to resist compression, as compared with the ordinary concrete. These tests were made on the Standard Testing Machine in the laboratories of the Worcester Polytechnic Institute.

Q. 6. What would you say as an expert on concrete construction that these tests demonstrate concerning the strength of concrete by the Hassam method as by the ordinary method?

A. These tests demonstrate that the Hassam concrete when used for a road is superior to the ordinary concrete in the figures above given, that is, the Hassam is 33 per cent stronger as against a bending strain and 42 per cent stronger to resist a crushing strain. These are the substantial strains a pavement or a pavement foundation are put to. For consideration, take a road 40 feet wide. The passage of a heavy team or truck over the same subjects the pavement to a bending strain with a load applied where the truck or team bears on the pavement. No one can tell exactly where the bending actually occurs, but it may occur at any and all points of the pavement and a pavement should be strong enough to resist any and all bending strains. A crushing strain is encountered by the direct downward pressure of the wheels on the foundation, which pressure if heavy enough, tends to disintegrate or pulverize the pavement or foundation. A pavement which is constructed better to resist these two strains is a better pavement.

CROSS-EXAMINATION BY COUNSEL FOR DEFENDANTS:

x-Q. 7. Mr. French, you are familiar with the process of grouting with grout consisting of Portland cement, sand and water, are you not?

A. I am.

x-Q. 8. How long have you been familiar with this process?

A. About twenty years.

x-Q. 9. How long have you been familiar with the use of grout by pouring on broken rock, slag, or other material for the purpose of forming a concrete?

A. I should say about ten years.

x-Q. 10. Where the grout is thin and the broken rock would consist of pieces from one and a half to three inches in diameter, will not the grout by gravity permeate the entire mass?

A. That will depend a great deal upon the thickness of the layer of broken stone, a thickness of from four to six or eight inches, if the stone contains a large percentage of quartz I should expect a thorough permeation of the grout. With greater thicknesses, grouting becomes a very unthorough, uncertain method for filling broken stone.

x-Q. 11. You mean greater than eight inches?

A. Yes.

x-Q. 12. From your experience, observation, and reading upon the subject of concrete, would you say that after a roadbed of broken rock had been rolled with say a ten-ton roller, until the voids were reduced to a minimum, that after the application of a grout until the same flushed to the surface, that the rolling after that of the mass would be of any benefit?

A. I should say that it would.

x-Q. 13. Why?

A. The rolling of the broken stone with the ten-ton roller consolidates the stone, decreases the voids, and makes difficult the entrance of the grout. Unrolled stone would present freer passages for the grout.

x-Q. 14. But if the ten-ton roller has so compressed the mass that there can be no further reduction of the voids, what effect upon the rock would the second rolling have?

A. The second rolling, while it would not further reduce the voids, does shake or agitate the broken stone sufficiently to be of material aid in the grout entering the voids of the stone.

x-Q. 15. In your direct testimony, in referring to the making of concrete by the mixing process, after it had been mixed and spread upon the road, you say, "I have never seen a steam roller employed for this purpose, and believe that difficulty would be found in attempting such a step, owing to the slippery, unstable condition of the mass." Would not the same conditions arise to rolling with a heavy roller after the grout has been applied?

A. Not at all. By the mixing process each particle of broken stone is coated with a wet or moist mortar, which serves until set, as a lubricant. Moreover, the percentage of mortar to the broken stone which must be used in the mixing process, is greater than the percentage of mortar or grout which can be put into the rolled stone. The naked stone which has been rolled with a heavy roller has been adjusted mechanically to

a closer fit than is possible for the stones in the mixing process to ever possess.

Cross-examination closed.

ARTHUR W. FRENCH.

WALTER E. HASSAM, being called as a witness on behalf of complainants, testifies as follows:—

DIRECT-EXAMINATION BY COUNSEL FOR COMPLAINANTS:

Q. 1. You are the Walter E. Hassam who has already testified for the complainants in this case?

A. Yes.

Q. 2. Assuming that in the method of making the so-called Hassam pavement, that a ten-ton roller was used in the initial step of crushing or solidifying the naked, uncoated, broken stone, and that thereafter, and after the step of grouting a five-ton roller was rolled over the grouted, crushed, broken stone, while the grout was still fluid, what effect would the five-ton roller have?

A. The five-ton roller would agitate the mass, permeate the grout into the stones and make a solid monolithic. I have noticed that after rolling the dry crushed stone with an eight-ton roller before the grouting and then using an eight-ton roller after the grouting, that the front roll on the eight-ton roller would agitate the mass to a considerable extent. This front roller of an eight-ton roller has less pressure to the square inch than the rear roller of a five-ton roller. This is due to the fact that in the case of an eight-ton roller and

a five-ton roller that three-fifths of the total weight is on the rear roll, and the width of a five-ton roller is 42 inches, an eight-ton roller is 53 inches wide. Therefore with an eight-ton roller the compression of the front roll is 136 lbs. to the sq. inch, and with a five-ton roller the compression is 157 lbs. to the sq. inch with its rear roll. It has been my experience after a great deal of study and practical experience that a Hassam pavement of dry stone, after being grouted, agitates very easily, even with heavy tampers after it had been rolled.

CROSS-EXAMINATION BY COUNSEL FOR DEFENDANTS:

x-Q. 3. Mr. Hassam, in your practical construction of what is known as Hassam pavement, what thickness of pea stone do you use as a top dressing?

A. No specified thickness. We use enough to take up the surplus grout that is forced out of the voids after rolling, or in other words after the voids are all full.

x-Q. 4. Approximately what thickness would that be?

A. From a half-inch down to almost nothing, a very thin coat.

x-Q. 5. After the street has been used for traffic, where the traffic is considerable, this coating of pea stone is soon removed, is it not?

A. From my observation we have pavements which have been laid four or five years and the pea stone is still intact, it being cemented into the grout.

x-Q. 6. Does that occur where traffic is heavy and where streets are often cleaned with street cleaners?

A. It would stay for a number of years, but would gradually wear out as all pavements do.

x-Q. 7. Is not the office of the pea stone merely to level up the street by filling small depressions left after the rolling of the grouted mass?

A. It is used for that purpose and also to fill up the voids between the stones. The object of the pea stone being to fill the angles of the other stone, making a homogeneous mass, and also to get as much stone into the pavement as possible.

x-Q. 8. Is the pea stone considered as a wearing surface?

A. It will do its part.

x-Q. 9. In the finishing of a Hassam pavement, is there any brooming required?

A. We have been in the habit of using a broom in order to get a more even surface.

Cross-examination closed.

WALTER E. HASSAM.

ALFRED THOMAS, being called as a witness on behalf of complainants, and being first duly sworn, testifies as follows:

DIRECT-EXAMINATION BY COUNSEL FOR COMPLAINANTS:

Q. 1. What is your name, age, residence, and occupation?

A. Alfred Thomas, age 56, Worcester, Mass.,

Treasurer of the Hassam Paving Co., and also connected with other corporations in business.

Q. 2. I presume you refer to the Hassam Paving Co. of Massachusetts?

A. Treasurer of the Hassam Paving Co. of Massachusetts.

Q. 3. How long have you been treasurer of the Hassam Paving Co.

A. This is the fifth year.

Q. 4. You are also director of it?

A. Yes.

Q. 5. And you are familiar with the details of its business?

A. I am.

Q. 6. Will you please state in a general way how the business of constructing and laying Hassam pavement is progressing, particularly this year?

Objected to as immaterial and not proper rebuttal testimony.

A. The business is increasing very rapidly. It is conducted by the Hassam Paving Co. of Massachusetts, and also by subsidiary and licensees companies who are given certain territory. I cannot give in detail the amount of business being conducted by the subsidiary companies or the licensees, as that does not become definite until the latter part of the year. The Hassam Paving Co. of Massachusetts business this year has more than doubled. The Connecticut Hassam Paving Co., of which also I am a director, has quadrupled its business this year. The State of New York has adopted this paving for upwards of 57 miles

of State highways this year, that is, this amount of road is finished or under construction this year.

Q. 7. Has the Hassam Paving been adopted for state highway in any other state?

A. Yes, Maine has adopted it and using it.

Q. 8. As a general proposition, then, the business of the Hassam paving as conducted by the Hassam Company of Massachussets is a growing and increasing business, is this correct?

(Same objection.)

A. It certainly is.

Q. 9. What is the capital of the Hassam Paving Company of Massachusetts?

(Same objection.)

A. \$500,000.

Q. 10. And, speaking generally, how much of an investment would you say had been made in the Hassam Paving Company of Massachussets, and its subsidiary companies to carry on the business of laying the Hassam pavement?

(Same objection.)

A. Upwards of a million dollars.

No cross-examination.

ALFRED THOMAS.

DISTRICT COURT OF THE UNITED STATES,

DISTRICT OF OREGON.

In Equity.

HASSAM PAVING COMPANY, a corporation, and OREGON HASSAM PAVING COMPANY, a corporation,

Complainants,

vs.

CONSOLIDATED CONTRACT COMPANY, a corporation, and PACIFIC COAST CASUALTY COMPANY, a corporation,

Defendants.

NOTARY'S CERTIFICATE.

I, C. Forrest Wesson, a notary public, in and for the Commonwealth of Massachusetts, do hereby certify that the foregoing depositions of Arthur S. Browne, Arthur W. French, Walter E. Hassam and Alfred Thomas, all residing more than one hundred miles from the place of trial, were taken before me as notary public, at the time and place stated in the record; that counsel for both parties were present during the entire taking of the depositions; that the witnesses were first duly sworn by me to tell the whole

truth before testifying, with the exception of Arthur S. Browne and Walter E. Hassam, who had been previously sworn in the case; that the testimony was taken on the typewriter by consent of counsel and read to the witnesses; that the witnesses duly signed their depositions; and that I am not connected by blood or marriage to any party in this suit, nor interested directly or indirectly in the event thereof, nor am I attorney or of counsel for either party.

[Signed] C. FORREST WESSON.

Worcester, Mass., Sept. 22, 1913.

UNITED STATES PATENT OFFICE

WALTER E. HASSAM, OF WORCESTER, MASSACHUSETTS, ASSIGNOR
ONE-HALF TO CHARLES K. PEVEY, OF WORCESTER, MASSACHUSETTS

PAVEMENT AND PROCESS OF LAYING THE SAME

No. 819,652.

Specification of Letters Patent.

Patented

Application filed June 7, 1905. Serial No. 264,188.

To all whom it may concern:

Be it known that I, WALTER E. HASSAM, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Pavements and Processes of Laying the Same; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to the making of stone or gravel roads or pavements, and it consists of an improvement in the method of making such roads or pavements, as hereinafter described, and particularly pointed out in the claims.

The object of my invention is to construct a cheaper, more durable, and for many purposes a more efficient road than has hitherto been constructed of broken stone or mixed stone and bituminous or other cement.

I have found that roads made of bituminous compounds after a certain period disintegrate and are expensive to repair. Roads constructed of concrete or stone and cement mixed before they are laid also crumble and break up in time because the presence of the partly-hardened cement between the stone when the mixture is laid prevents the stone from being brought close together by compression, but causes comparatively large cement-filled voids to be left between said stone, and said cement soon disintegrates because it was necessarily disturbed in setting by the mixing operation. It is a well-known fact that if cement is left undisturbed until it has entirely set it will be very strong and durable; but if it is mixed or otherwise disturbed during the time it is setting it will not last. It is therefore essential that the cement used in the construction of roads and pavements be handled and mixed as little as possible and that it be used or laid as soon as possible after it has been mixed. Owing to the employment of unskilled and careless

less durable than it would be under the best circumstances.

No bituminous material method of construction of broken stone or gravel, sand. The street is first dug out to the for the subgrade, which is rolled. Broken stone or gravel is then to proper depth and rolled with or compressed by any suitable the voids between the stone the surface even. It will be there is no coating of cement or other material on the pieces of be compressed very close together and the voids left between them tremely small. When the has been compressed to the desired and firmness, it is grouted with cement, sand, and water, which prepared until immediately before used and which does not require handling, like the mixture for therefore does not suffer from by careless workmen. All filled with the cement in the tion. The cement is then allowed until perfectly hard, and a solid obtained for brick, stone or any other form of paving which a heavier load than if mixed. Grouting is not only a great over the old method of mixing hand, but it reduces the cost. Instead of brick, stone-block or other surfaces stated above pour a thicker grout of cement water over the foundation to depth, spread fine-broken stone upon it, and roll or compress stone or gravel into the grout or before it is set, making a smooth surface. It has been found that this method produces a durable, up-to-date road, with from top to bottom, and that pair. It will be understood

tom layer of hard-rolled uncoated stone, a grouting of cement placed upon said stone and filling all the voids therein, and a suitable surface placed on said grout.

5 2. A road or pavement consisting of a bottom layer of hard-rolled uncoated stone, a grouting of cement placed upon said stone and filling all the voids therein, a second layer of grouting placed on the first layer and
10 a top layer of smaller uncoated stone compressed into the surface of said second layer of grouting before it is set.

3. The process of constructing a road or pavement which consists in laying a layer of

uncoated stone, compressing said stone until 15 the voids are small, then grouting with a mixture of cement, sand and water until all the voids in the stone layer are filled, adding a thicker grout of cement, sand, and water, spreading fine stone upon said grout and 20 compressing it into the surface of said grout before it is set.

In testimony whereof I affix my signature in presence of two witnesses.

WALTER E. HASSAM.

Witnesses:

CHAS. K. PEVEY,

A. E. HAMM.

UNITED STATES PATENT OFFICE.

WALTER E. HASSAM, OF WORCESTER, MASSACHUSETTS, ASSIGNOR TO THE HASSAM PAVING COMPANY, OF WORCESTER, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

PROCESS FOR LAYING PAVEMENT.

No. 851,625.

Specification of Letters Patent.

Patented April 23, 1907.

Application filed November 14, 1906. Serial No. 343,459.

To all whom it may concern:

Be it known that I, WALTER E. HASSAM, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Processes for Laying Pavement; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to a process of constructing stone or gravel roads or pavements and it is designed particularly as an improvement on my previous invention patented May 1, 1906, No. 819,652. The process of laying the pavement as described in said patent consists in first laying a layer of uncoated stone, compressing said stone until the voids therein are small, then grouting with a mixture of cement, sand and water until said voids are filled and lastly adding a suitable surface to the foundation thus made. In laying the pavement according to this process, great difficulty has been experienced in distributing the grout in such manner that it will run into and fill all the voids of spaces in the stone layer. This is due to the air which is compressed or imprisoned in said voids and the dust which accumulates on the stone. It has also been found that the imprisoned air has a tendency to force its way through the grouting with the result that the surface thereof is covered with small air holes.

The object of the present invention is to lay the pavement and particularly the grout in such a manner that all the voids in the stone layer will be filled therewith and no holes will be left in the surface.

The invention consists primarily in agitating the grout as and after it is placed upon the stone whereby any air holes that may appear are closed up, the air is forced out of the voids and said voids are filled with the grout. A solid and homogeneous mass is thereby obtained which will last indefinitely. To properly agitate the grout, I preferably employ a steam roller which may be the same used for compressing the stone. Whereas in the old manner of laying the pavement the rolling was stopped after the stone had been compressed, in the present process the rolling

is continued during and after the grouting is added. It has been found that said rolling may be continued until the grout has percolated the stone layer before said grout sets.

The present process consists in constructing a foundation by laying a layer of uncoated stone, compressing said stone layer until the voids therein are small, grouting the same with a mixture of cement, sand and water, agitating the mass by rolling or otherwise compressing it until the stone layer is compact and the grout flushes up to the surface showing that all the voids or spaces between the stone have been filled with the grout. Similarly constructed layers of stone and grout may be added to the first one until the desired thickness is reached. Any suitable surface may be placed on the foundation thus formed but I prefer to use another layer of grout, preferably thicker, with fine stone in its surface. The fine stone may be mixed with said layer of grout or the latter may be laid first and the fine stone spread upon and pressed into its surface before it has become set. The surface may be smoothed, preferably by brooming, to the desired contour before the grout sets.

I claim:

1. The process of constructing a road or pavement which consists in laying a layer of uncoated stone, compressing said stone layer until the voids therein are small, grouting with a mixture of cement, sand and water, agitating the mass to expel the air and fill the voids between the stone with said grout and repeating said process of laying layers of stone and grout and agitating the same until the desired thickness is reached.

2. The process of constructing a road or pavement which consists in laying a layer of uncoated stone, compressing said stone layer until the voids are small, grouting with a mixture of cement, sand and water, agitating the mass to expel the air and fill the voids between the stone with said grout, and placing a surface on the mass thus formed.

3. The process of constructing a road or pavement which consists in laying a layer of uncoated stone, compressing said stone layer until the voids are small, grouting with a mixture of cement, sand and water, agitating the mass to expel the air and fill the voids between the stone with said grout, adding an-

other layer of grout and fine stone and smoothing the surface to the desired contour before it is set.

4. The process of constructing a road or pavement which consists in laying a layer of uncoated stone, compressing said stone layer until the voids are small, grouting with a mixture of cement, sand and water, agitating the mass to expel the air and fill the voids between said stone with the grout, adding another layer of grout, spreading fine stone upon said grout and smoothing to the desired contour before it has set.

5. The process of constructing a road or pavement which consists in laying a layer of uncoated stone, compressing said stone layer

until the voids therein are small, grouting with a mixture of cement, sand and water, agitating the mass to expel the air and fill the voids between said stone with the grout, repeating said process of laying layers of stone and grout and agitating the same until the desired thickness is reached, adding another layer of grout, spreading fine stone upon said grout and smoothing to the desired contour before it has set.

In testimony whereof, I affix my signature, in presence of two witnesses.

WALTER E. HASSAM.

Witnesses:

CHAS. K. PEVEY,
EDITH M. TOLLEY.

W. E. HASSAM.

ARTIFICIAL STRUCTURE AND PROCESS OF MAKING THE SAME.

APPLICATION FILED NOV. 30, 1906.

Fig. 1.

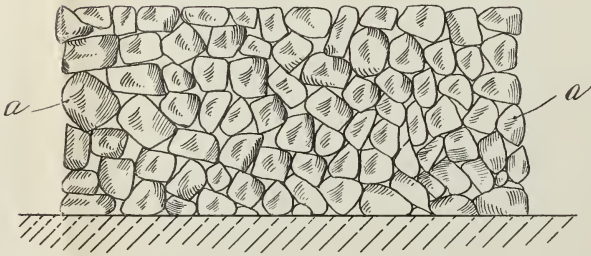
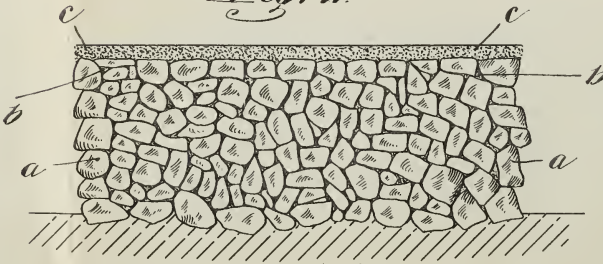


Fig. 2.



Witnesses:
C. F. Messon
E. M. Allen.

Inventor:
Walter E. Hassam
By Attorneys
Lutigate & Lutigate

UNITED STATES PATENT OFFICE.

WALTER E. HASSAM, OF WORCESTER, MASSACHUSETTS, ASSIGNOR TO HASSAM PAVING COMPANY, OF WORCESTER, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

ARTIFICIAL STRUCTURE AND PROCESS OF MAKING THE SAME.

No. 861,650.

Specification of Letters Patent.

Patented July 30, 1907.

Application filed November 30, 1906. Serial No. 345,729.

To all whom it may concern:

Be it known that I, WALTER E. HASSAM, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented a new and useful Artificial Structure and Process of Making the Same, of which the following is a specification.

My invention relates to an artificial structure capable of use for foundations, walls, abutments, columns, floors, etc., but especially adapted for pavements for roads, sidewalks, and the like.

In a prior patent granted to me on the first day of May 1906, No. 819,652 I have described a structure in which, broken stone, gravel, or the like has been placed on the bottom of an excavation and rolled to compact the same, and the broken stone or gravel has been treated with a grouting or the like, subsequent to its rolling, and a suitable wearing surface has been placed thereon.

The principal object of this invention is to provide for improving the surface layer, and the improved surface layer can be used either with those constructions and methods which involve the use of previously coated stone, or with that which is carried out with uncoated stone afterwards grouted.

Reference is to be had to the accompanying drawings, in which

Figure 1 is a sectional view of a portion of an excavation with uncoated stone placed therein, ready to be compressed, and Fig. 2 is a similar view of the structure as completed constituting a pavement.

In carrying out the invention, the bottom of the excavation is preferably rolled, and then a layer of broken stone or gravel *a* is placed therein and rolled hard. For example, it may be eight inches deep when originally placed in position, and rolled or compressed until it is six inches deep.

In the preferred embodiment of the invention, the stone is placed in position in an uncoated state and rolled hard or compressed and thereafter grouted with a more or less thin cement grouting *b* to fill all the voids among the stone. The invention also may be carried out in connection with the method which consists in coating the stones before they are placed in the excavation

and rolled. In either event, a layer of grouting *c* is placed on the layer of stones. If previously coated stones are used, this surfacing layer *c* has to be applied as a separate step of the process, but if uncoated stones are employed, the grouting is poured down upon them, not only until it fills the voids, but until the layer *c* is produced, so that this is a continuation of the grouting *b* and homogeneous therewith.

In order to produce a suitable surface on top of the pavement or other structure which is being made, uncoated fine or pea stones are rolled into the layer *c* before the cement has a chance to set or harden. The top layer *c* however, may be formed of a mixture of sand, cement, and fine pea stones preferably in substantially equal proportions, and a suitable amount of water and applied to the top of the layer of hard rolled stones.

While I have illustrated and described a preferred embodiment of my invention, I am aware that modifications may be made therein without departing from the spirit of the invention as expressed in the claims.

Having thus described my invention, what I claim is:—

1. An artificial structure comprising a foundation layer of hard rolled stone having grouting filling the voids therein and a surface layer comprising a continuation of said grouting containing fine stones compressed into its surface.
2. A road or pavement consisting of a bottom layer of hard rolled uncoated stone, a grouting of cement placed upon said stone and filling all the voids therein, and a top layer of smaller uncoated stones compressed into the surface of said grouting before it sets.
3. A road or pavement consisting of a bottom layer of stone, a grouting placed upon said stone and filling all the voids therein, and a top layer of smaller uncoated stone compressed into the surface of said grouting before it sets.
4. The method of making a pavement which consists in rolling uncoated stone, placing a thin grouting thereupon, allowing the grouting to run down and fill the voids in the layer of stones, and compressing fine uncoated stones into said grouting before it sets.

In testimony whereof I have hereunto set my hand, in the presence of two subscribing witnesses.

WALTER E. HASSAM.

Witnesses:

LOUIS W. SOUTHGATE,
MARY E. REGAN.

2—396.

UNITED STATES OF AMERICA,

Cut.

DEPARTMENT OF THE INTERIOR,

PATENT OFFICE.

TO ALL PERSONS TO WHOM THESE PRESENTS SHALL
COME, GREETING:

THIS IS TO CERTIFY *That the annexed* are true
copies of all Instruments of writing found of record
from January 28, 1903, up to and including May 15,
1912, which may affect the title of the

Letters Patent of

Walter E. Hassam, Assignor of One-half to Charles
K. Pevey,

Number 819,652, Granted May 1, 1906,

for

Improvement in Pavements and Processes of Laying
the Same;

and

Letters Patent of

Walter E. Hassam, Assignor to Hassam Paving Com-
pany,

Number 861,650, Granted July 30, 1907,

for

Improvement in Artificial Structures and Processes of
Making the Same,

and

Letters Patent of

Walter E. Hassam, Assignor to The Hassam Pav-
ing Company,

Number 851,625,

Granted April 23, 1907,

for

Improvement in Processes of Laying Pavement.

Recorded in Liber and page as designated on the margin of each Instrument.

Said record has been carefully compared with the original and is a correct transcript of the whole thereof.

IN TESTIMONY WHEREOF I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington this 23rd day of May, in the year of our Lord one thousand nine hundred and twelve and of the Independence of the United States of America the one hundred and thirty-sixth.

[SEAL]

F. A. TENNANT,

Acting Commissioner of Patents.

Liber V-71,

Page 457.

ASSIGNMENT OF INVENTION AFTER APPLICATION AND
BEFORE PATENT.

Whereas, I Walter E. Hassam of Worcester in the County of Worcester and State of Massachusetts, have invented certain new and useful improvements in Pavement and Process of Laying the Same for which, on the seventh day of June 1905, made application, (Serial No. 264,188), for Letters Patent of the United States, whereof I am now the sole owner of the territory hereinafter assigned;

AND WHEREAS, Charles K. Pevey, of the same place is desirous of acquiring an interest therein, and in the Letters Patent to be obtained therefor:

NOW, THEREFORE, to all whom it may concern, be it known, that for and in consideration of one dollar and other valuable consideration to me in hand paid, the receipt whereof is hereby acknowledged, I have assigned, sold, and set over, and do hereby assign, sell, and set over, unto the said Charles K. Pevey an undivided one-half interest in the full and exclusive right, title, and interest in and to the said invention, as fully set forth and described in the specification prepared and executed by me preparatory to obtaining Letters Patent therefor, and I do hereby authorize and request the Commissioner of Patents to issue the said Letters Patent to the said Charles K. Pevey and myself as the assignees of my right, title, and interest in and to the same, for our sole use and behoof, and for the use and behoof of our legal representatives.

In Testimony Whereof, I hereunto set my hand and affix my seal this 12 day of June, A. D. 1905.

Walter E. Hassam (L. S.)

Two Witnesses: { Alex J Hamm
Chas K. Pevey

Recorded June 14, 1905.

Liber P-75,
Page 80.

ASSIGNMENT.

WHEREAS I, WALTER E. HASSAM, of Worcester, County of Worcester State of Massachusetts, have invented two new and useful ARTIFICIAL STRUCTURES & PROCESS OF MAKING THE SAME, for which I am about to make two applications for letters-patent of the United States, and

WHEREAS THE HASSAM PAVING COMPANY, of said Worcester, a corporation duly created and existing under the laws of the State of Massachusetts, is desirous of acquiring the entire right, title, and interest in said two inventions, and in all letters-patent, reissues, or extensions to be obtained therefor in this or any foreign country:

NOW, THEREFORE, TO ALL WHOM IT MAY CONCERN: Be it known that for and in consideration of the sum of one dollar to me in hand paid, and other good and valuable considerations unto me moving, the receipt of which is hereby acknowledged, I, the said Walter E. Hassam, have sold, assigned, and transferred, and by these presents do sell, assign, and transfer unto the said Hassam Paving Co. the full and exclusive right to the said inventions as fully set forth and described in the specifications of the two applications prepared and executed by me on even date herewith preparatory to obtaining letters-patent of the United States therefor, together with the same interest in all patents, reissues

or extensions that may be obtained thereon in this or any foreign country:

AND I DO HEREBY AUTHORIZE AND REQUEST the Commissioner of Patents to issue all letters-patent, re-issues or extensions based on said inventions to the said Hassam Paving Co. as the assignee of my entire right, title, and interest in and to the same, for the sole use and behoof of the said Hassam Paving Co. and its legal representatives or assigns.

IN TESTIMONY WHEREOF I have hereunto set my hand and affixed my seal this 28th day of November, 1906.

WALTER E HASSAM [SEAL]

ACKNOWLEDGMENT

CITY & COUNTY OF WORCESTER, }
State of Massachusetts } ss

Then on the day and year above written personally appeared before me the said Walter E Hassam who acknowledged the foregoing assignment to be his free act and deed to the end that the same might be recorded and proved as such.

LOUIS W SOUTHGATE
Notary Public

LOUIS W SOUTHGATE
Notary Public
Worcester Co
Worcester Mass.

[SEAL]

Recorded November 30th 1906

Liber R-75,

Page 123.

Assignment of Invention after Application and Before Patent

WHEREAS, I, Walter E. Hassam of Worcester in the County of Worcester and State of Massachusetts have invented certain new and useful improvements in Process for Laying Pavement for which, on the 14th day of November 1906, I made application (Serial No. 343,459,) for Letters Patent of the United States, whereof I am now the sole owner of the interest hereinafter assigned;

AND WHEREAS, The Hassam Paving Company a corporation organized and existing under the laws of the State of Massachusetts and having its principal place of business at Worcester Massachusetts, is desirous of acquiring an interest therein, and in the Letters Patent to be obtained therefor:

NOW THEREFORE, to all whom it may concern, be it known, that for and in consideration of one dollar dollars (\$1—) to me in hand paid, the receipt whereof is hereby acknowledged, I have assigned, sold, and set over, and do hereby assign, sell, and set over, unto the said The Hassam Paving Company the full and exclusive right, title, and interest in and to the said invention, as fully set forth and described in the specification prepared and executed by me preparatory to obtaining Letters Patent therefor, and I do hereby authorize and request the Commissioner of Patents to

issue the said Letters Patent to the said The Hassam Paving Company as the assignee of my right, title, and interest in and to the same, for its sole use and behoof, and for the use and behoof of its successors and assigns.

In Testimony Whereof, I hereunto set my hand and affix my seal this 15th day of November A. D. 1906

WALTER EDWIN HASSAM [L. S.]

Two Witnesses:

CHAS K PEVEY

EDITH M. TOLLEY

Recorded Dec. 28, 1906

Liber E-76,

Page 251.

ASSIGNMENT.

WHEREAS I, WALTER E. HASSAM, of Worcester, County of Worcester, State of Massachusetts, did invent a new and useful PAVEMENT AND PROCESS OF LAYING THE SAME for which I duly applied for letters-patent of the United States; and whereas I assigned one-half interest in said invention to CHARLES K. PEVEY of said Worcester; and whereas Letters-Patent were granted on said invention May 1, 1906, No. 819,652, which patent issued as assigned one-half to said Charles K. Pevey; and whereas we are now the sole owners of said patent and of all rights under the same; and

WHEREAS HASSAM PAVING COMPANY of said Worcester, a corporation duly created and existing under the laws of the State of Massachusetts, is desirous

of acquiring the entire interest in said invention, and in all letters patent, reissues or extensions now or hereafter to be obtained on said invention in this or any foreign country:

NOW, THEREFORE, TO ALL WHOM IT MAY CONCERN: Be it known that for and in consideration of the sum of One Dollar to us in hand paid, and other good and valuable considerations unto us moving, the receipt of which is hereby acknowledged, we, the said Walter E. Hassam and Charles K. Pevey have sold, assigned and transferred, and by these presents do sell, assign and transfer unto the said Hassam Paving Company the whole right, title and interest in and to the said invention, and in and to the said letters-patent granted thereon, and in and to all further letters-patent, reissues or extensions that may be obtained thereon in this or any foreign country, the same to be held and enjoyed by the said Hassam Paving Company for its own use and behoof, and for the use and behoof of its legal representatives, to the full end of the term for which said letters-patent, reissues or extensions are or may be granted, as fully and entirely as the same would have been held and enjoyed by us had this assignment and sale not been made.

AND FOR THE FOREGOING CONSIDERATIONS we hereby agree to execute all applications for further patents, reissues or extensions, assignments, or powers-of-attorney that may be necessary to protect said invention by further patents, reissues or extensions in this or any foreign country, and to vest the title thereto in the said Hassam Paving Company.

AND FOR THE FOREGOING CONSIDERATIONS we have sold, assigned and transferred, and do hereby sell, assign and transfer all rights to back damages or profits that may exist against any person, firm or corporation who has infringed upon said patent while we have held title thereto, and hereby authorize and empower the said Hassam Paving Company to sue for and collect the same in its own name, and to its own use, and for the use and behoof of its legal representatives or assigns.

IN TESTIMONY WHEREOF we have hereunto set our hands and affixed our seals at said Worcester, this fourteenth day of March, 1907.

WALTER E. HASSAM [SEAL]

CHARLES K. PEVEY [SEAL]

ACKNOWLEDGMENT.

CITY & COUNTY OF WORCESTER,)
 State of Massachusetts. } s.s.

Then on the day and year above written, personally appeared before me the said Walter E. Hassam and Charles K. Pevey who acknowledged the foregoing assignment to be their joint free act and deed to the end that the same may be recorded and proved as such.

GEORGE T. DEWEY

Notary Public.

GEORGE T. DEWEY

Notary Public

Worcester Co.

Mass.

[SEAL]

Recorded March 22, 1907.

Liber V-77,
Page 399.

KNOW ALL MEN: That The Hassam Paving Company, a corporation duly organized under the laws of the State of Massachusetts and located and doing business in Worcester in said State, for the consideration of one dollar and other valuable considerations, the receipt whereof in full is hereby acknowledged, does hereby sell and grant to The Connecticut Hassam Paving Company, a corporation duly organized under the laws of the State of Connecticut and located and doing business in New Haven in said State, a license to construct and lay pavements under, and to use United States Letters Patent #819,652, being for an improvement in pavement and the process of laying the same, in all that portion of New York State south of the following counties: Rensselaer, Fulton, Onondaga, Genesee, Orleans, Albany, Herkimer, Cayuga, Frie, Oswego, Schenectady, Oneida, Wayne, Chatauqua, Cortland, Montgomery, Madison, Monroe, Niagara and Jefferson, during the life of said patent.

The Hassam Paving Company, its successors and assigns, covenants to and with said The Connecticut Hassam Paving Company, its successors and assigns, that it has full right and title to make this license in manner and form as herein expressed, and that there is no prior assignment, grant, mortgage, license, or other conveyance or incumbrance under or relating to said patent that can prevent said The Connecticut Hassam Paving Company from enjoying the privileges con-

veyed by this license to the full extent herein given and stated.

IN WITNESS WHEREOF, The Hassam Paving Company has hereunto set its hand and seal in duplicate, as of and for the 15th day of May, 1907, acting by Walter E. Hassam, its General Manager and Agent hereunto duly authorized, this instrument having first been approved by M. J. Whittall, the President of the Company, as required by its by-laws.

THE HASSAM PAVING COMPANY,
By WALTER E. HASSAM
Its General Manager and Agent
hereunto duly authorized.

Witnesses:

ALFRED THOMAS

M. Y. ANDERSON

Approved:

M. J. WHITTALL

President, The Hassam
Paving Company.

[Hassam
Paving Com- [SEAL]
pany Seal
Worcester
Mass.]

Recorded January 9, 1908.

Liber V-77,
Page 400.

KNOW ALL MEN: That The Hassam Paving Company, a corporation duly organized under the laws of the State of Massachusetts and located and doing business in Worcester in said State, for the consideration of one dollar and other valuable considerations, the receipt whereof in full is hereby acknowledged, does hereby sell and grant to The Connecticut Hassam Paving Company, a corporation duly organized under the laws of the State of Connecticut and located and doing business in New Haven in said State, the exclusive license, within the State of Connecticut, to construct and lay pavements under, and to use United States Letters Patent #819,652, being for an improvement in pavement and the process of laying the same, during the life of said patent.

The Hassam Paving Company, its successors and assigns, covenants to and with said The Connecticut Hassam Paving Company, its successors and assigns, that it has full right and title to make this license in manner and form as herein expressed, and that there is no prior assignment, grant, mortgage license, or other conveyance or incumbrance under or relating to said patent that can prevent said The Connecticut Hassam Paving Company from enjoying the privileges conveyed by this license to the full extent herein given and stated.

IN WITNESS WHEREOF, The Hassam Paving Company has hereunto set its hand and seal in duplicate,

as of and for the 15th day of May, 1907, acting by Walter E. Hassam, its General Manager and Agent hereunto duly authorized, this instrument having first been approved by M. J. Whittall, the President of the Company, as required by its by-laws.

THE HASSAM PAVING COMPANY,
By WALTER E. HASSAM
Its General Manager and Agent.
hereunto duly authorized.

Witnesses:	[Hassam	
ALFRED THOMAS	Paving Com-	
M. Y. ANDERSON	pany Seal	[SEAL]
Approved:	Worcester	
M. J. WHITTALL	Mass.]	
President, The Hassam Paving Company.		

Recorded January 9, 1908

AGREEMENT made this 16th day of July, A. D. 1909, by and between the HASSAM PAVING COMPANY, a corporation duly established by law and having its usual place of business in the City and County of Worcester and Commonwealth of Massachusetts, party of the first part, and the OREGON HASSAM PAVING COMPANY, a corporation duly established by law and having its usual place of business in the City of Portland and State of Oregon, party of the second part;

WITNESSETH:

THAT WHEREAS, letters patent of the United States, bearing the following numbers:

819,652;	851,625;	861,650;
861,651;	890,902;	912,125;

for an improvement in pavement and foundations and process of laying the same, are now owned by the party of the first part; and

WHEREAS the party of the second part desires to use and make said improvement in pavement and foundations and process of laying the same according to said letters patent;

NOW, THEREFORE in consideration of one dollar and other valuable consideration each to the other party paid, the receipt whereof is hereby acknowledged, it is mutually agreed as follows:

1. The party of the first part hereby gives to the party of the second part the exclusive right to use and make said improvement in pavement and foundations

and process of laying the same according to said letters patent, for and during the term beginning the 16th day of July, A. D. 1909, and ending with the expiration of the term of said letters patent, in the State of Oregon, and a strip in the southern part of the State of Washington, extending from the westerly line of said State eastward to the Columbia River, and being twenty-five miles in width, measured from the southern boundary of the State of Washington, north, and not elsewhere or in any other place.

2. The party of the second part agrees to pay to the party of the first part therefor, as a license fee or royalty the sum of fifteen (15) cents for each and every square yard of the improved pavement (known as "Hassam Pavement") described in said letters patent, and used or made by said party of the second part in said territory during the term of this agreement; and nine (9) cents for each and every square yard of foundation (known as "Hassam Foundation") described in said letters patent, when used or made by said party of the second part under any other kind of pavement except Hassam Pavement for streets and sidewalks; provided, however, that if any foundation less than five inches (5") in thickness be made, said royalty per square yard shall be ratably reduced so that such royalties shall bear the same proportion to nine (9) cents that the thickness of said foundation bears to five inches.

3. The license fees and royalties shall be due and payable on or before the 20th day of each month for all

pavement or foundations made or used during the preceding month.

4. The party of the second part shall at all times keep accurate accounts and make full returns in writing to the party of the first part on the 20th day of each month of the number of square yards used or made by it during the previous month. Such returns, if the party of the first part shall so require, shall be verified by oath of the party of the second part or someone in its behalf; and the party of the first part shall have the right, either by its officers or its attorney, to examine any and all of the books of account of said party of the second part containing any items, charges, memoranda or information relating to the use or making of said improvement or process; and upon request made by the party of the second part shall produce all such books and papers for said examination.

5. The party of the second part agrees not to contest the validity of said letters patent and the rights of the party of the first part thereunder at any time during the continuance of this agreement.

6. The party of the second part further agrees to assign to the party of the first part any patents or claims to patents, relative to an improvement for a street pavement constructed of stone, sand and hydraulic or Portland cement or process therefor, in which it may be directly or indirectly interested, or to which it may become entitled during the continuance of this license, and for a term of three years after the termination hereof, or after the extension or renewal of the same.

7. The party of the second part agrees to make no contract for the use or making of said pavement or foundation according to said letters patent, unless such contract provides for the execution of the work in accordance with the approved specifications, a copy of which is hereto annexed.

No variation of said approved specifications shall be made, unless the consent in writing of the party of the first part is first obtained, or unless the party of the first part shall make any variation therein and give notice thereof in writing to the party of the second part by mailing such notice to the last known business address of the party of the second part.

The party of the second part agrees to conform in all respects to said approved specifications or to variations therein approved or made by the party of the first part, and to perform truly and faithfully all work called for thereby; and agrees that in the event that it does not conform to said specifications or to the variations therein in the performance of the work called for therein, in accordance therewith, of which the party of the first part shall be the sole judge, the party of the first part may take possession of the work and complete the same, according to said specifications or variations, at the expense of the party of the second part which expense and any damage caused by said failure or default, the party of the second part agrees to pay.

8. The rights herein granted are on the express condition that the party of the second part shall, within each period of twelve months following the date of this agreement during the term thereof, use said patent by

the actual construction of work to an extent to cause it to pay the said party of the first part within each of said periods, royalties or license fees amounting to not less than the sum of five thousand dollars (\$5,000.), and in the event of said party of the second part failing to pay the party of the first part the license fees or royalties above set forth, then the rights herein granted, at the option of the party of the first part, may be revoked by notice in writing from the party of the first part, in the manner hereinafter specified.

The party of the first part reserves the right to waive any one or more breaches in the above agreement on the part of the party of the second part, and such waiver of any one or more shall not operate as a waiver of them all; it being the intent of the parties that if, in the judgment of the party of the first part, the party of the second part is laying and constructing as much pavement as is practicable or possible under all the circumstances of the case in said territory, then that said party of the first part may not, if it so elects, take advantage of any technical breach or otherwise.

9. It is further agreed, that if the royalties or license fees, or any part thereof, shall at any time be in arrears for thirty days after the same shall have become due, or if the party of the second part shall have become bankrupt or insolvent, or enter into any composition with its creditors, or shall make any default in performing any of the agreements herein contained, which agreements are to be construed as conditions of the license hereby granted, the party of the first part, may terminate its license, by notice in writing given to the

party of the second part by mailing such notice to its last known business address, which license shall thereupon become void, without prejudice to any right of action or remedy of the party of the first part for the recovery of any moneys then due to it hereunder, or in respect of any antecedent breach of any agreement herein contained; and provided further, that if the party of the second part shall discontinue the use of this license, and shall not in the said territory use or make said pavement or process of laying the same for a space of six months in any year, the party of the first part shall be at liberty, by notice in writing, given as aforesaid, to terminate this license without prejudice to any right of action or remedy for the recovery of any moneys then due to it hereunder.

10. The party of the second part further agrees to use its utmost reasonable endeavors to create and maintain as large a business as possible in the making of said improved pavements and processes in all the above specified territory.

If the said party of the first part is not satisfied with the endeavors of the party of the second part to create and maintain a business of satisfactory size, it reserves the right to enter said territory and to make contracts for paving at a price not less than one dollar and ninety cents (\$1.90) per square yard for finished pavement. Said contracts are to be taken in the name of the party of the second part who agrees that it will execute the same and in default of said execution the party of the first part may enter and execute the contract or contracts and revoke the license.

And if the party of the second part shall not at any time during the continuance of this agreement make all reasonable endeavors (and of the reasonableness of the endeavors, the party of the first part is the sole judge) to secure contracts in all portions of the aforesaid territory, the party of the first part shall be at liberty at any time, on notice as above specified, to revoke this license as to such part of said territory as it shall deem not to have been favorably worked or exploited.

If, in the opinion of the party of the first part, the party of the second part by reason of its interest in other pavements, or by reason of its becoming licensed as to other pavements, shall not be doing for said Hassam Pavement all that it should, then said party of the first part may revoke this license at any time by notice in writing as above specified, but any such revocation contemplated in this clause shall not operate to take away from said party of the second part the right to finish existing contracts or to take and execute contracts made on bids filed with any municipality as of the time when said license is revoked.

11. The party of the second part shall not assign any rights hereunder without the consent and approval in writing of the party of the first part being first obtained.

12. This agreement is executed and delivered in the Commonwealth of Massachusetts and shall be construed and interpreted in accordance with the laws thereof.

IN WITNESS WHEREOF the parties hereto set their hands and cause their seals to be affixed by their proper officers thereunto duly authorized, the day and year first above written.

HASSAM PAVING COMPANY

By WALTER E. HASSAM Gen. Mgr.

OREGON HASSAM PAVING COMPANY

By J. A. MILLER, Pres.

[SEAL.]

Approved

ALFRED THOMAS

[SEAL.]

Treas.

APPROVED SPECIFICATIONS FOR LAYING A
HASSAM CEMENT-CONCRETE PAVING.

TIME COMMENCED: Work upon said pavement shall be commenced by the contractor within _____ days after the date of this contract and shall be pushed with diligence until completed.

STREET OPENED: Only so much of the street shall be opened and obstructed from travel at any one time, by the contractor as shall meet with the approval of the _____.

EXCAVATION: The roadway shall be excavated by the contractor to a depth of _____ from the finished grade of the street.

If the sub-soil is of a clay or loamy nature, it shall be excavated to an extra depth of _____ and shall be refilled with gravel or cinders and then rolled or compressed to the proper sub-grade.

THICKNESS: The thickness of said pavement shall be at least six (6") inches from the sub-grade to the finished grade of the street.

PAVING: Upon the sub-grade, after being thoroughly rolled or compressed to a true and even surface at least six (6") inches below the finished grade, shall be spread a layer of stone varying in size from $2\frac{1}{2}$ " to $1\frac{1}{2}$ " to conform with the grades and contour of the street after rolling. After this stone has been thoroughly compacted by rolling or compression and firmly imbedded and the voids reduced to a minimum, it shall be grouted with a grout

consisting of one part Portland cement to one part sand. This grout shall be poured upon the stone until all the voids are filled and the grout flushes to the surface. The rolling or compression to continue during the process of grouting. Upon this surface shall be placed a very thin layer of pea stone which shall be spread and rolled or compressed even and smooth over the entire surface, rolling to continue until grout flushes to surface.

EXPANSION JOINTS: Suitable expansion joints shall be provided at the curb and across the street, as the contractor may direct.

CEMENT: All cement shall be of first quality Portland cement.

SAND: The sand shall be fine, clean and sharp and free from clay or loam.

WATER: All water necessary for the construction of the pavement shall be furnished free of cost to the contractor by the

STONE: The broken stone may be of any proper or suitable grain or quality.

STREET CLOSED: All paving shall be kept without travel for a period of at least six (6) days after the completion if necessary in the judgment of the contractor, before being opened to the public for use.

MARKING OF PAVING: Every street laid shall be marked with a suitable mark, with the inscription, "Patented May 1, 1906; April 23, 1907; July 30, 1907; June 16, 1908."

HASSAM

PAVEMENT.

~~of the second part the right to make and use said im-~~
proved foundations and process according to the ap-
proved specifications for laying HASSAM CEMENT—
Concrete foundation for any surface attached hereto,
marked "A," under the whole or any part of the area
of pavement to be laid in the _____ of
_____ for the term of one year
from the date hereof.

283

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[Faint, illegible handwriting on the right page]

HASSAM PAVEMENT

ITS CONSTRUCTION AND ADVANTAGES

ORIGIN The Hassam Pavement was invented by Mr. Walter E. Hassam, a man of sound road-building sense, developed by long, practical experience. Mr. Hassam was formerly Street Commissioner of the City of Worcester, Mass., and later President of the Massachusetts State Highway Association. The pavement was patented in 1906, and all patent rights are owned by the Hassam Paving Company, of Worcester, Mass.

SIMPLICITY As is the case with many other great inventions this Hassam Pavement is remarkable because of its simplicity. There is no secret and mystifying process. Every detail of its construction is open and comprehensible, and the closest scrutiny is welcomed.

of the second part the right to make and use said im-
 proved foundations and process according to the ap-
 proved specifications for laying HASSAM CEMENT—
 Concrete foundation for any surface attached hereto,
 marked "A," under the whole or any part of the area
 of pavement to be laid in the of
 for the term of one year
 from the date hereof.



Hassam Pavement in a Beautiful Residence Section
of Portland, Oregon

PROCESS OF CONSTRUCTION Its method of construction consists of placing a layer of hard, tough broken rock, free from fine rock, dirt and dust, on a carefully prepared and rolled sub-grade. This layer of rock is made uniform in depth and of sufficient thickness to give a full six inches after being thoroughly compacted by rolling with a steam roller.

The voids in the rock are then completely filled with "grout," which consists of one part Portland cement to two parts sand, mixed with sufficient water to make the grout flow freely into the voids of the rock, or about the consistency of thick cream. This grout is mixed thoroughly and continuously in specially constructed Hassam Grout Mixers, from which it flows by gravity through four-inch metal conductors and is distributed directly onto the street.



E. Fifteenth Street
Portland, Oregon

in the second part the right to make and use said im-
 proved foundations and process according to the ap-
 proved specifications for laying HASSAM CEMENT—
 Concrete foundation for any surface attached hereto,
 marked "A," under the whole or any part of the area
 of pavement to be laid in the of
 for the term of one year
 from the date hereof.



Hassam Pavement on Multnomah Street, Portland, Oregon. Holladay Park at the Right has "Hassam" on Four Sides

It percolates rapidly and freely into the rock and no one who has seen the operation can doubt for a moment that the rock voids are absolutely filled by this grout.

Upon the surface thus prepared, a very thin layer of pea-sized broken rock is uniformly spread. The steam roller is again brought into service immediately after (almost simultaneously with) this grouting process and the grouted pavement is carefully rolled and "ironed" out. This second rolling practically "drives" the grout into the interstices of the rock and has somewhat the same action that "clamping" has when two boards are glued together by a cabinet maker. The surface of the pavement is then broomed, which process removes the surplus water and gives the finishing touches to the appearance of the street.



E. Washington Street
Portland, Oregon

of the second part the right to make and use said im-
 proved foundations and process according to the ap-
 proved specifications for laying HASSAM CEMENT—
 Concrete foundation for any surface attached hereto,
 marked "A," under the whole or any part of the area
 of pavement to be laid in the _____ of
 _____ for the term of one year
 from the date hereof.



Hassam Pavement in the Warehouse District, Stockton, California

DURABILITY The unique methods peculiar to the construction of the Hassam Pavement render it many advantages, not the least among which is great durability. The use of the heavy roller on the rock before it is grouted, as well as afterward on the rock and mortar combined, give the Hassam "Compressed Concrete" a compressive strength many times that of concrete mixed in the old-fashioned manner; while the use of the very rich grout of cement and sand gives an unusually high tensile strength which is still further increased by the interlocking of the broken rock brought about by the thorough rolling. The result of the Hassam method of construction is the strongest and densest form of concrete known today which is applicable to practical uses.



Foot of East Washington Street, Portland, Oregon

of the second part the right to make and use said im-
 proved foundations and process according to the ap-
 proved specifications for laying HASSAM CEMENT—
 Concrete foundation for any surface attached hereto,
 marked "A," under the whole or any part of the area
 of pavement to be laid in the _____ of
 _____ for the term of one year
 from the date hereof.



General View of British Columbia Parliament Buildings at Victoria, showing Hassam Pavement in Driveways

SANITARINESS Its very density and imperviousness prevent the absorption of injurious foreign liquids and gases and insure sanitation and ease of cleaning.

ADAPTABILITY Hassam Pavement has a remarkable range of advantageous uses. It is the most comfortable hard-surface pavement in existence. In the hot summer days it does not radiate an intense heat as do bituminous and asphaltic pavements. And it does not soften under the sun's rays, and become sticky and hard to pull over, but always maintains a surface over which it is easy to travel and to haul a vehicle. In the winter, the rains do not render Hassam Pavement slippery. On the contrary both horses and automobiles can travel over it with absolute safety and maximum efficiency whether wet or dry. It fills the requirements of both heavy and light traffic.



A Beautiful Suburban Drive, Portland, Ore.

of the second part the right to make and use said improved foundations and process according to the approved specifications for laying HASSAM CEMENT—Concrete foundation for any surface attached hereto, marked "A," under the whole or any part of the area of pavement to be laid in the _____ of _____ for the term of one year from the date hereof.



Hassam Pavement on Portland Heights, a $7\frac{1}{2}$ Per Cent Grade

**LABOR AND MATERIAL FOUND
IN EVERY LOCALITY**

Not only is "Hassam" adaptable for use in all climates, but it can be laid, in nearly every instance, with materials which are native to every locality or state, so that money expended on material and labor for Hassam Pavement assists local industries and remains in the community where the pavement is laid. Thus the community has both the pavement and the money. Cement, sand, rock, water and proper workmanship combined furnish the essential requirements for laying this pavement.

REPAIRING No unwieldy and special apparatus is required to make the repairs which may be necessitated by the tearing up of the Hassam Pavement by water, gas, telephone or other companies. Repairs can



Wasco Street
Portland, Oregon

of the second part the right to make and use said im-
proved foundations and process according to the ap-
proved specifications for laying HASSAM CEMENT—
Concrete foundation for any surface attached hereto,
marked "A," under the whole or any part of the area
of pavement to be laid in the _____ of
_____ for the term of one year
from the date hereof.



Hassam Pavement, Vista Avenue, Portland, Oregon.
The portion of the street occupied by the streetcar
tracks is also paved with "Hassam"

be made with but little equipment and expense, and with reasonable care one can procure a patch which is almost impossible to detect. This item of ease of repairing is vital to the smaller towns and cities where the cost of sending to a larger city for a contractor to make repairs (as is necessary with bituminous pavements requiring special and expensive plants) is great.

HUMANE Because of its sure footing and ease of traction Hassam Pavement is being endorsed extensively by Humane Societies and horse-owners. President Nelson, of the Spokane Horse-owners' Association, after a thorough investigation of Hassam in Portland, Ore., stated, "We found that it wears with a rough surface and that the pavement four years old gives even a better footing for horses than the new pavement."

Hassam Pavement
Surrounds Beautiful
Homes. (Portland,
Oregon)



of the second part the right to make and use said im-
 proved foundations and process according to the ap-
 proved specifications for laying HASSAM CEMENT—
 Concrete foundation for any surface attached hereto,
 marked "A," under the whole or any part of the area
 of pavement to be laid in the of
 for the term of one year
 from the date hereof.



View of Cut Made in Hassam Pavement at Coeur
d'Alene, Idaho

"It satisfies the most skeptical"

AS OTHERS SEE US

Portland, Ore., September 21, 1910.

".....City of Portland has something more than ten miles of Hassam Pavement at the present time, six of which was laid this year. In addition there is about nineteen miles under contract, and plans have been ordered for upwards of twenty miles more upon petition of property owners. It has given good satisfaction."

(From a message.)

(Signed) J. W. MORRIS,

City Engineer.

THE RATE OF INCREASED USE OF HASSAM PAVEMENT is well illustrated in the case of Portland, Ore., as shown in the following table:

Year	Approximate No. Yards	Miles
1908.....	8,000	½
1909.....	63,000	4
1910.....	217,000	13
1911.....	500,000	29
Total.....	788,000	46½



Water Front District
Portland, Oregon

of the second part the right to make and use said im-
 proved foundations and process according to the ap-
 proved specifications for laying HASSAM CEMENT—
 Concrete foundation for any surface attached hereto,
 marked "A," under the whole or any part of the area
 of pavement to be laid in the _____ of
 _____ for the term of one year
 from the date hereof.



Hassam Pavement on Sherman Street, Coeur d'Alene, Idaho

"From all points of view, cost included, a thoroughly satisfactory pavement."—H. B. Wright, City Engineer of Coeur d'Alene.

BOARD OF PUBLIC WORKS
City of Spokane, Wash.

February 20, 1911.

To Whom it May Concern:

The Inland Empire Hassam Pavement Company laid about eleven blocks of their pavement on Indiana Avenue last year. We watched the construction of this very closely and found that it was laid with the utmost care and strictly according to specifications; and from this fact it is sure to be a lasting pavement.

It is sanitary on account of its smooth surface; still, it is not slippery, having just enough grit on the surface to give a good foot-hold for horses traveling over it.

It is standing up under the heaviest kind of traffic and we believe that Hassam is going to be the most popular pavement in Spokane when the Company gets thoroughly established and the people learn the good features of it.

We heartily recommend the Hassam Pavement to any district or city wishing to put in pavement.

(Signed) J. C. ARGALL, Secretary.

GEO. M. MUDGETT, Street Com'r.



On the Water Front,
 Stockton, California

of the second part the right to make and use said im-
 proved foundations and process according to the ap-
 proved specifications for laying HASSAM CEMENT—
 Concrete foundation for any surface attached hereto,
 marked "A," under the whole or any part of the area
 of pavement to be laid in the _____ of
 _____ for the term of one year
 from the date hereof.



Hassam Pavement, Indiana Avenue, Spokane, Wash-
ington

AMERICAN TRUST CO.

Coeur d'Alene, Idaho, February 15, 1911.

Inland Empire Hassam Paving Company,
Spokane, Wash.

Gentlemen:

The Hassam Pavement that was laid in Coeur d'Alene last year is proving a great success. We think the thirty thousand square yards will prove an everlasting roadway for our town, and one for which we have been looking. We feel confident that it is the best and cheapest pavement on the market today.

We have no hesitation in recommending your pavement to any inquiring.

Yours truly,

(Signed) C. H. CHAMBERLAIN, Manager.

E. Thirty-third Street
Portland, Oregon



of the second part the right to make and use said im-
proved foundations and process according to the ap-
proved specifications for laying HASSAM CEMENT—
Concrete foundation for any surface attached hereto,
marked "A," under the whole or any part of the area
of pavement to be laid in the of
for the term of one year
from the date hereof.



Coeur d'Alene's (Idaho) Automobile Fire Truck and
Brigade on Hassam Pavement

CITY OF COEUR D'ALENE, IDAHO
Fire Department

February 20, 1911.

To Whom it May Concern:

The Hassam Pavement laid in Coeur d'Alene last year is giving the best of satisfaction to all who have occasion to ride over it.

We have both horses and auto-trucks in our department and I have observed that the horses run on this pavement with the utmost confidence—they do not slip and the pavement does not injure their feet. This pavement is also desirable for automobiles as the surface has just enough grit to keep it from being slippery. The auto-trucks do not skid as they turn the corners, and it does not matter much how fast they are traveling.

I wish to say that I, as well as my firemen, are very much pleased with Hassam Paving and would not hesitate to recommend it to anyone.

(Signed) J. H. O'ROURKE,
Chief of Fire Department.

Grand Avenue
Portland, Oregon

"The most heavily
traveled street on the
East Side."





Hassam Pavement, Hunter Street, Stockton, California

Coeur d'Alene, Idaho, February 1, 1911.

To Whom it May Concern:

The Inland Empire Hassam Paving Company, under contract with the City of Coeur d'Alene, Idaho, constructed about thirty thousand square yards of Hassam Concrete Pavement, fully complying with specifications and performing the work in a most thorough and conscientious manner.

I have never known street contractors who were more courteous or desirous of doing first-class work.

The very nature of the construction of Hassam Concrete Pavement is sure to make it a lasting and very satisfactory pavement. It is pleasing in appearance, smooth, yet not slippery, our firemen heartily endorse it for either horses or automobile trucks, and we are all very much pleased with it.

(Signed) BOYD HAMILTON,
Mayor of Coeur d'Alene, Idaho.

East Eleventh and
Milwaukie Streets
Portland, Oregon

"The main thorough-
fare leading south."





Hassam Pavement in Driveway, Parliament Building Grounds, Victoria, British Columbia

Coeur d'Alene, Idaho, February 1, 1911.

Inland Empire Hassam Paving Company,
Spokane, Wash.

Gentlemen:

The correct combination of trap rock, sand and cement thoroughly compacted, is the fundamental basis of all permanent pavement.

I believe that your method of paving embodies correct principles and produces a permanent pavement which for appearance, durability and use, both for horses and automobiles, is equal, if not superior, to any pavement now in use.

Your pavement in Coeur d'Alene has an excellent appearance, is not slippery nor dusty, will wear, I believe, indefinitely, with practically no cost for repairs, and is from all points of view, cost included, a thoroughly satisfactory pavement.

Yours truly,

(Signed) H. B. WRIGHT,

City Engineer, Coeur d'Alene, Idaho.

Nineteenth Street
Portland, Oregon





Hassam Pavement at Entrance to Parliament Buildings, Victoria, British Columbia

INMAN-POULSEN LUMBER COMPANY
Oregon Pine Lumber
Annual Capacity 150 Million Feet

Portland, Oregon, July 5, 1910.

Oregon Hassam Paving Company, Board of Trade Building, City.

Dear Sirs: We beg to say that the block of Hassam Pavement recently laid in our yard fully meets our expectation. We do not hesitate to recommend the same as the most satisfactory pavement we have yet seen. This is especially true because of its rough surface which furnishes a team with a good footing; in our case this is a prime requisite.

Very truly yours,

INMAN-POULSEN LUMBER CO.,

Per H. B. VanDuzer.

Form 2289

NIGHT LETTER

THE WESTERN UNION TELEGRAPH COMPANY

INCORPORATED

25,000 OFFICES IN AMERICA

CABLE SERVICE TO ALL THE WORLD

ROBERT C. CLOWRY, PRESIDENT

BELVIDERE BROOKS, GENERAL MANAGER

RECEIVER'S NO.

TIME FILED

CHECK

RECEIVED AT Lewiston, Idaho

ALWAYS
OPEN }
}

COPY

Worcester, Massachusetts, September 25, 1911.

L. J. Perkins, Mayor, Lewiston, Idaho.

Just awarded 11,000 yards of straight Hassam Pavement to the Hassam Paving Company. Granite blocks and Hassam Pavement the two most popular pavements in Worcester.

F. H. CLARK, Street Commissioner.

CITY OF SPOKANE
Headquarters Fire Department

Spokane, Washington, September 5, 1911.

Inland Empire Hassam Paving Company, 322 Lindelle Block, Spokane Wash.

Gentlemen: Referring to your request for a letter giving my opinion of Hassam Pavement. I am much pleased with it. Horses have perfect confidence on this pavement, whether wet or dry, and it appears to be easy on the horses. Auto-trucks cannot skid when on Hassam, and for our department consider it the best in the city.

Yours truly,

A. H. MYERS,
Chief Engineer, Fire Department.

Stockton, California, September 25, 1911.

The Mayor of Lewiston, Lewiston, Idaho.

Hassam Pavement has given entire satisfaction in this city where it has been laid during the past three years. The City Council awarded the Hassam people a contract when they were \$1,532.36 higher than the bid for standard asphalt pavement. You will make no mistake by putting down Hassam.

OSCAR E. WRIGHT,
Superintendent of Streets of the City of Stockton.
HENRY R. BUDD, City Engineer.

EXTRACT FROM REPORT OF COMMITTEE

To the East Sprague Avenue Improvement Club.

Gentlemen: The undersigned, a committee to investigate the different paving materials used in the City of Portland, would respectfully submit the following:

The committee were in Portland on April 10 and found that a variety of pavements were being used, such as brick, basalt blocks, creosote blocks, bitulithic, granitoid, asphalt and Hassam concrete.

The investigation was made under favorable circumstances, as regards the merit of paving under wet weather, it raining continuously during the stay of the committee in Portland.

HASSAM: This pavement is all in good condition, some of it having been laid for four years. On one street leading to a brick yard over which there is much heavy traffic, the pavement was examined carefully and there was little or no evidence of wear. It has never been repaired and to all outward appearances is as good as the day it was laid. This pavement is being laid quite extensively in Portland; there being something like fifteen miles now in use, and we understand that the contract has been let for about twenty miles more.

This pavement seems to take on the nature of a conglomerate, and is as hard as stone, being composed of crushed basaltic rock, sand and cement. The surface is rough, so that there is no danger of horses slipping or automobiles skidding. Teamsters speak very favorably of it on this account. On streets where asphalt has formerly been laid the street railway company have used this kind of pavement in many instances between the tracks and we noticed on these streets that the teamsters kept on this pavement.

As it was raining we were permitted to make our examination under the worst conditions possible. There were very few low places where the water could stand, and we saw no places where the pavement was disintegrated in any way. There were a few cracks or checks, but not any chipping.

We saw them laying this pavement and they were doing it in better shape in Portland than in Coeur d'Alene, as the surface there shows none of the large rocks we have complained of in our former reports. They seem to be confining themselves strictly to their contract and specifications.

It is the opinion of your committee that the Hassam Pavement, if laid according to specifications, taking into consideration the cost of the material, durability, maintenance of same, and the rough surface which is especially adapted for heavy traffic, is the best of any of the pavements we have seen, and we would respectfully recommend the same for East Sprague Avenue.

Respectfully submitted,

D. I. DONOVAN, Chairman.

F. L. McFADDEN.

E. G. ROSS.

Committee.

Spokane, Washington, April 18, 1911.

PACIFIC COAST LICENSEES

HASSAM PAVING COMPANY OF BRITISH COLUMBIA

344 Granville St., Vancouver, B. C.

INLAND EMPIRE HASSAM PAVING COMPANY

Lindelle Building, Spokane, Wash.

OREGON HASSAM PAVING COMPANY

Board of Trade Building, Portland, Ore.

BUILDERS

OF

HASSAM COMPRESSED CONCRETE
PAVEMENTS

HASSAM PAVING COMPANY

OF

WORCESTER, MASSACHUSETTS

SLATER BUILDING
WORCESTER, MASSACHUSETTS



PACIFIC COAST DIVISION OFFICE
PORTLAND, OREGON

320

PORTLAND PRINTING HOUSE COMPANY
388 TAYLOR STREET
PORTLAND, OREGON

2. The party of the second part agrees to make full and true returns to the party of the first part on the fifteenth day of every month in the year, of the number of square yards made by said party of the second part during the previous month, of said improved foundation and process; and if said party of the first part shall not be satisfied in any respect with any such returns, then the party of the first part shall have the right, either by its officers or its attorney to examine any and all of the books of account of said party of the second part containing any items, charges, memoranda, or information relating to the making or laying of said patented improvement or process, and upon request made said party of the second part shall produce all such books for said examination.

3. The party of the second part agrees to pay the party of the first part, as a license fee or royalty ten cents for each and every square yard of foundation (known as Hassam foundation) described in said letters patent, when made or used by the party of the second part under any kind of pavement.

The whole of said license fees or royalties for each month as hereinbefore specified shall be due and payable on or before the fifteenth day of every month for the foundation made during the previous month.

4. The party of the second part agrees not to contest the validity of said letters patent and the rights of the party of the first part thereunder at any time during the continuance of this agreement, provided that the party of the first part is not in default in the per-

formance of its covenants hereinafter set forth in sections 6 and 7.

5. Upon the failure of said party of the second part to keep each and all of its agreements herein set forth, which are to be construed as conditions of this license, the party of the first part may at its option terminate this license, and such termination shall not release said party of the second part from any liability due to said party of the first part.

6. Said party of the first part covenants with said party of the second part that it has full right and title to make this license as above set forth, and that there is no prior grant or license under said patent in the territory above described.

Said party of the first part further covenants that in case said letters patent shall be infringed, the party of the first part shall at its own cost take all proceedings to defend and protect the same.

And in default of taking such proceedings by the party of the first part after the expiration of sixty days after said notice by the party of the second part, it shall be lawful for the party of the second part by notice in writing given to the party of the first part or left at its usual place of business to terminate this agreement.

7. The party of the first part hereby covenants and agrees with the party of the second part, that it will protect and save harmless the said

against any and all suits brought
against it on account of the use of said letters patent,
claiming infringement of their patents or anything of
such nature.

8. The party of the first part hereby further agrees that it will send an expert man to instruct the said _____ in the manner of laying said foundation for a period of time of such length as will be necessary so that the _____ of said _____ can thoroughly and competently build said foundation, and that said party of the first part will bear the full and entire expense of sending said expert.

IN WITNESS WHEREOF the said
 by _____ its
 thereto duly authorized, hereunto sets its name and corporate seal, and the Hassam Paving Company, by Walter E. Hassam, its Agent, thereunto duly authorized, hereunto sets its name and corporate seal the day and year first above written.

.....

By.....

.....

By.....

.....

“A”

APPROVED SPECIFICATIONS FOR LAYING
A HASSAM CEMENT-CONCRETE
FOUNDATION FOR ANY
SURFACE.

EXCAVATION: The roadway shall be excavated by the contractor to the required depth from the finished grade of the street. Upon the sub-grade, after being thoroughly rolled or compressed to a true and even surface, broken stone or gravel shall be spread to the thickness of which the surface will be at the required top grade of foundation, after rolling or compressing.

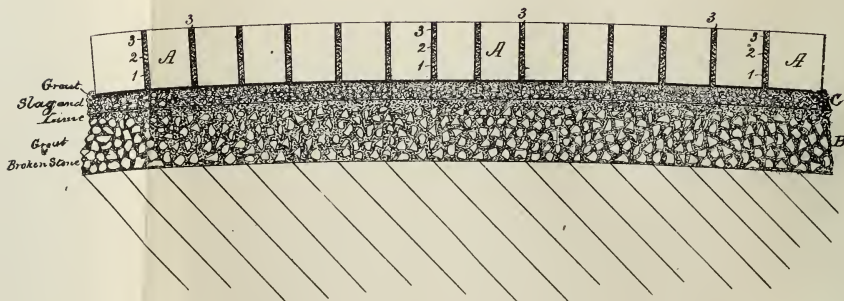
After this stone has been thoroughly compacted and firmly imbedded and the voids reduced to a minimum, it shall be grouted with a grout of Portland cement and sand consisting of one part Portland cement and four (4) parts sand. This grouting shall be poured upon the foundation until all the voids are filled and the grout flushes to the surface. The stone to be rolled or compressed during the process of grouting.

(No Model.)

J. MURPHY.
Pavement.

No. 238,706.

Patented March 8, 1881.



WITNESSES:

W. W. Hollingsworth
Amos N. Hart

INVENTOR:

John Murphy
BY *Wm. L. Le*

ATTORNEYS.

UNITED STATES PATENT OFFICE.

JOHN MURPHY, OF COLUMBUS, OHIO.

PAVEMENT.

SPECIFICATION forming part of Letters Patent No. 238,706, dated March 8, 1881.

Application filed January 26, 1881. (No model.)

To all whom it may concern:

Be it known that I, JOHN MURPHY, of Columbus, in the county of Franklin and State of Ohio, have invented a new and Improved Pavement; and I do hereby declare that the following is a full, clear, and exact description of the same.

My invention is an improvement in the class of pavements composed of stone blocks laid upon a concrete or other water-tight foundation.

I form my pavement of stone blocks, broken stone, and grout, applied and combined as hereinafter described, reference being had to accompanying drawing, which shows a vertical section of the pavement and road-bed.

The letter A indicates the rectangular stone blocks forming the wearing-surface of the pavement.

B is a layer of broken stone and grout; C, a layer of slag and lime and a grout and sand filling for the interstices of the blocks.

In constructing the pavement the first step is to prepare the road-bed. If this be wet or springy soil it should be underdrained, and is, in any case, to be properly graded. Upon such bed I spread a layer of broken stone or slag, B, to the depth of about six (6) inches, which is grouted and then rolled with a heavy roller, to form a firm and solid foundation.

If the soil is dry and solid the broken stone may be dispensed with and a thin layer of gravel employed instead, which must, however, be well rolled. Having thus formed a firm bed or foundation, the next step is to deposit thereon a layer, C, of pulverized slag and lime mixed with sand. This layer should be about two or three inches in depth. The stone blocks A are then laid in courses, so as to break joints, and the interstices are filled with grout, 1, to the depth of two or three inches from the bottom of the blocks. I next spread clean screenings over the stone surface until the interstices are filled or nearly so. This filling, 2, is then packed or pressed until it has a depth of one or two inches over the grouting. Its function is to keep the blocks steady in their place while being rammed,

which is the succeeding step. After ramming the interstices are filled to the top with grout-
ing, 3, thus making a level surface, which completes the pavement proper. Upon its surface a coat of sand is then spread, and the pavement will be ready for use in from twelve to twenty-four hours.

The grout I employ is made of the following ingredients in or about the proportions stated: Lime, ground or slaked, (blue lias preferred,) twenty per centum; sand, clean and pure, thirty per centum; iron slag or furnace cinders, twenty-five per centum; Portland cement ten per centum; silica, or oxide of iron, ten per centum; cast-iron filings, sulphur, &c., five per centum.

The layer of slag and lime C, under the stone blocks A, is well saturated with water in the process of constructing the pavement, and becomes very hard. The grout is very adhesive, and becomes harder with time, and hence in the course of a year the pavement becomes practically a solid stony mass, of about sixteen inches in depth, which is impervious to water. The pavement is, moreover, sufficiently elastic to render it easy for vehicles, while the noise incident to their passage over it is considerably deadened.

The cheapness and durability of the pavement especially commend it.

I am aware that block-stone pavements have been used in which the interstices between the blocks were filled with asphaltum, concrete, or other mastic; but such filling disintegrates and becomes useless in a few years; whereas my pavement becomes more and more hard and solid with lapse of time, and improves with age.

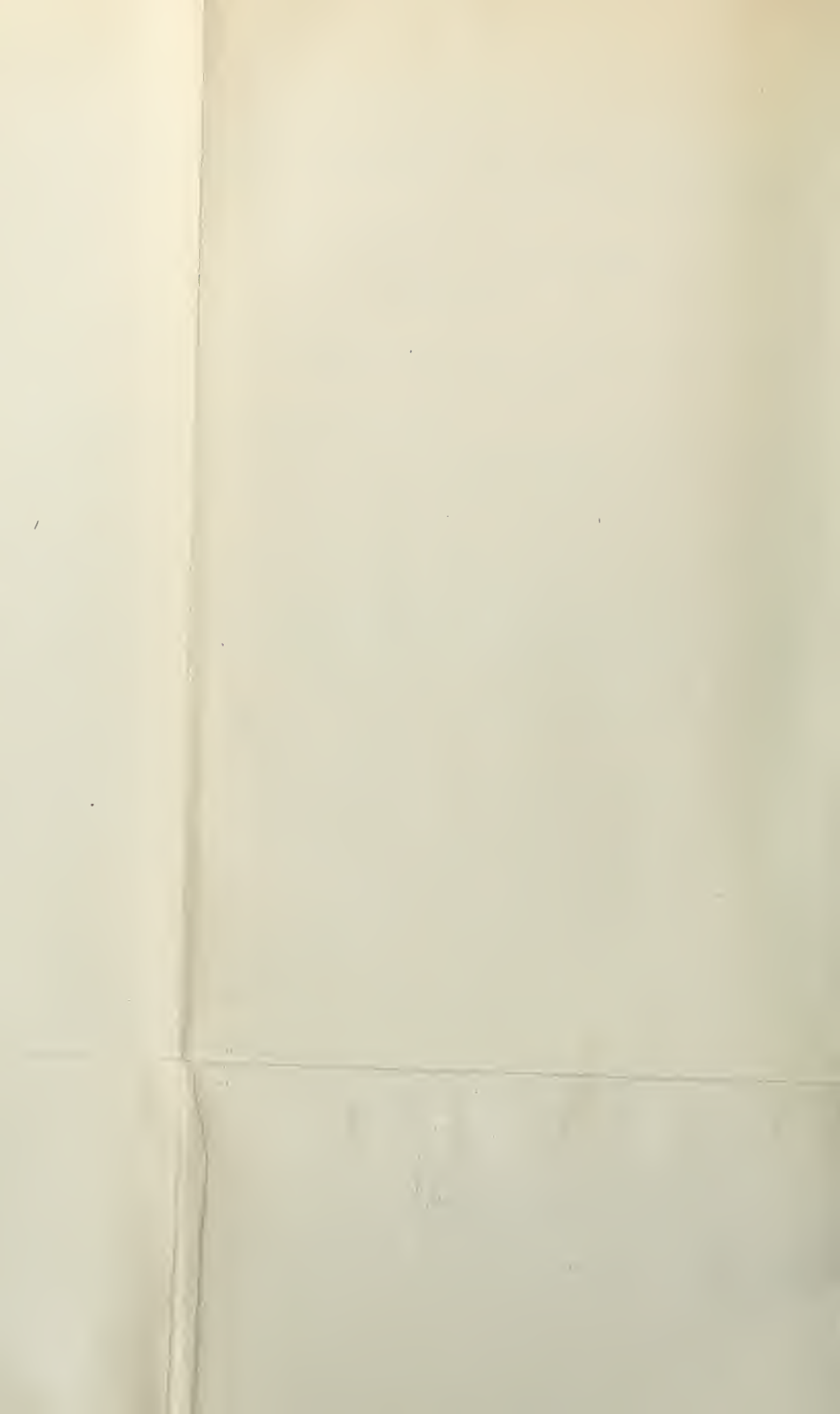
What I claim is—

The improved pavement, formed of the broken stone and grout foundation B, the layer C, of slag and lime, the stone blocks A, and the interstitial filling of grout, all as shown and described.

JOHN MURPHY.

Witnesses:

J. D. SULLIVAN,
J. G. ODEL.



UNITED STATES PATENT OFFICE.

GEORGE A. BAYARD, OF BELLEFONTE, PENNSYLVANIA.

CONCRETE PAVEMENT.

SPECIFICATION forming part of Letters Patent No. 381,667, dated April 24, 1888.

Application filed December 28, 1887. Serial No. 259,258. (No specimens.)

To all whom it may concern:

Be it known that I, GEORGE A. BAYARD, a citizen of the United States, residing at Bellefonte, in the county of Centre and State of Pennsylvania, have invented a new and useful Improvement in Concrete Pavements, of which the following is a specification.

My invention relates to improvements in concrete pavements, which will be hereinafter more fully described.

I first lay a foundation or base of coarse broken stone and ashes or pebbles and roll the same until thoroughly settled, after which I mix broken stone, cinders, and pebbles with tar and form a second or intermediate layer of this. This intermediate layer is preferably from three to four inches thick, and after it has been thoroughly rolled I spread over its surface a layer (from one-half to two inches thick) of sand or ashes, small pebbles, and coal-tar well mixed together. This layer must also be consolidated by rolling and the surface rendered as smooth as possible. This third or surface layer is intended to fill up all depressions, smooth the uneven places, and present a surface such as the finished work is intended to have. Over this surface is spread a filling-coat consisting of coal-tar, resin, and unslaked lime, in the following proportions: coal-tar, twenty gallons; resin, two to two and one-half pounds; lime, two to two and one-half pounds. These ingredients must be well mixed together and boiled, and the mixture is poured over the surface of the last or surface layer in a liquid state. All pavements of this general construction—namely, one or more layers of broken stone joined by tar or cement—are very porous, and this filling-coat is designed to fill all the pores and interstices, so as to render the pavement perfectly solid and water-tight. To this end the mixture is poured on the pavement until no more will be absorbed. Ordinary surface-cement, as Portland or its equivalent, is now spread over the pavement,

and it is again rolled, after which sharp sand is spread over the surface. This construction makes a pavement which is water-tight and solid, with no appreciable porosity, therefore allowing no chance for it to absorb moisture from the ground and remain in a damp state. The water will also flow off the surface more readily and quickly.

It will be seen that there are three distinct layers in this pavement—namely, a foundation-layer of coarse stone, an intermediate layer of smaller stone, cinders, pebbles, and coal-tar, and a surface-layer of sand or ashes, small pebbles, and coal-tar well mingled. These three layers, after being successively rolled, are finally consolidated as firmly as possible, are then united by a filling-coat or mixture which percolates through the pores and interstices which have not been closed by rolling and unites the layers to form a perfectly water-tight impervious mass. The lime in the filling renders the same very hard when it becomes calcined by exposure. Before this filling mixture becomes thoroughly hard, however, the surface-cement, as before described, and the sand are added.

Having thus described my invention, I claim as follows:

The improved concrete pavement herein described, consisting of a foundation-layer of coarse broken stone and ashes or pebbles, a second layer of broken stone, cinders, pebbles, and tar, a third layer of sand, small pebbles, and coal-tar, resin, and unslaked lime, and a surface-coating of cement and sand, as described and specified.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in presence of two witnesses.

GEORGE A. BAYARD.

Witnesses:

WILBUR F. REEDER,
W. E. GRAY.



UNITED STATES PATENT OFFICE.

THOMAS F. HAGERTY, OF SAN FRANCISCO, CALIFORNIA.

CONCRETE PAVEMENT.

SPECIFICATION forming part of Letters Patent No. 413,278, dated October 22, 1889.

Application filed October 22, 1888. Serial No. 288,848. (No specimens.)

To all whom it may concern:

Be it known that I, THOMAS F. HAGERTY, a citizen of the United States, residing at San Francisco, county of San Francisco, State of California, have invented new and useful Improvements in Bituminous Concrete Pavements for Streets, Sidewalks, Roofing, and Flooring, of which the following is a specification.

Heretofore asphaltum concrete pavements when laid on streets or sidewalks in a homogeneous mass required to have the foundation-bed prepared for the reception of the bituminous covering, and the cumbersome heating apparatus and fuel, asphaltum, tar, oil, gravel, sandstone, &c., were brought to the place, encumbering the streets for days and weeks, involving a great deal of time and labor. To obviate this difficulty is one of the main objects of my invention; and to this end my improved process consists in preparing a solid foundation with as even a surface as possible by laying a sufficient thickness of coarse rubble and a top coating of a thin grout prepared with sand and cement, or with evenly-laid stone blocks having a grout of cement and sand poured between the interspaces, or in the case of sidewalks preparing the surface with stone rubble and leveling off the top with either sand or mortar, the object in all cases being to secure a well-prepared even surface to receive the top dressing, which can be accomplished by any of the well-known methods now in use.

Previous to laying the top dressing on a road-bed which has been coated with a grout cement, I coat the same when dry with a wash of hot pitch-tar all over the surface. Upon a foundation thus prepared I lay slabs of bituminous sandstone or other concrete asphaltum compounds of a uniform thickness. In practice I prefer to use bituminous rock—such as is now obtained in many parts of California—for the reason that nature has provided it with the greatest amount of fine quartz, sand, or gravel with the least practical quantity of volatile carbonaceous matter to unite said sandy particles, and cause them to adhere and form a black firm compact elastic mass.

In order to better unite the bituminous sandstones of different qualities and consist-

ency to produce the best results obtainable, and for sake of economy in handling and transportation, the slabs can be manufactured with better advantage at the mines. The material is reduced by heat to the proper consistency by any of the well-known methods, and by suitable presses and molds are formed into slabs of, say, two inches thick, or of any practical thickness and size to conveniently handle without bending or breaking.

I do not confine myself to reducing the natural bituminous sandstone to a plastic consistency by means of artificial heat in order to press it in the molds, as by sufficient pressure applied to the natural material the disintegrated particles will be forced to adhere and form a homogeneous mass.

The process of manufacturing the slabs or blocks forms no part of the present invention, and may be accomplished by any of the well-known methods.

Slabs thus prepared are laid upon a road-bed or sidewalk previously described as close as practicable, and by means of a heavy heated roller are pressed, so that by the heat and pressure applied the edges are caused to unite and the under side to adhere to the pitch-tar coating, thus forming a level homogeneous mass.

It is not an essential part of my invention to have a road-bed of a hard, even, uniform surface, as it is obvious that when the heat and pressure are applied the plastic mass will conform to any slight unevenness of surface that may exist; nor is it essential to previously wash the surface of the road-bed with pitch-tar, as the nature of the material used may be such as to have sufficient volatile carbonaceous matter to cause it to adhere without such coating.

I claim—

1. The process of covering streets and other surfaces with bituminous or concrete substances capable of being softened by heat in order to make pavements floors, or roofs, consisting, first, in pressing the bituminous or concrete substance into blocks or slabs; secondly, laying these blocks or slabs upon the roadway or surface to be covered, so that their edges will be in juxtaposition, and, thirdly, in passing a heated iron or roller over the edges of the adjoining blocks or slabs, so

as to unite their edges by heat, substantially as described.

2. The process of making pavements, roofs, and floors, consisting, first, in preparing a foundation of coarse rubble and a top coating of thin grout; secondly, coating the surface of the foundation with hot pitch-tar; thirdly, placing upon said pitch-coated foundation blocks or slabs of bituminous or concrete

substances which are capable of being softened by heat; fourthly, uniting the edges of such bituminous or concrete blocks or slabs by means of heat, substantially as above described.

THOMAS F. HAGERTY.

Witnesses:

JOHN HAGERTY,
DANIEL HAGERTY.

No. 675,430.

Patented June 4, 1901.

F. J. WARREN.
PAVEMENT OR ROADWAY.

(Application filed Jan. 9, 1901.)

(No Model.)

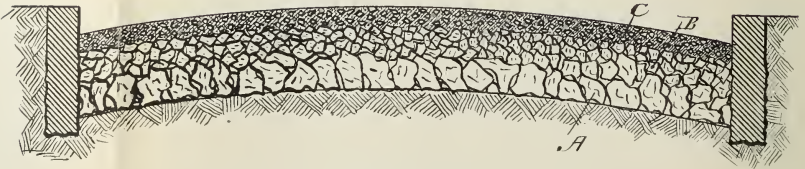


Fig. 1.

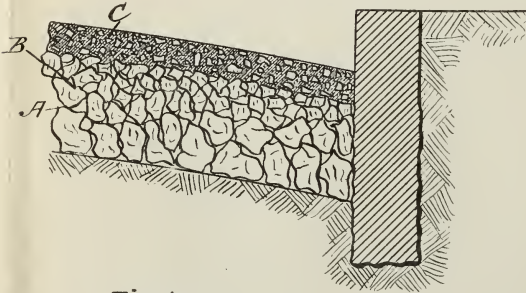


Fig. 2.

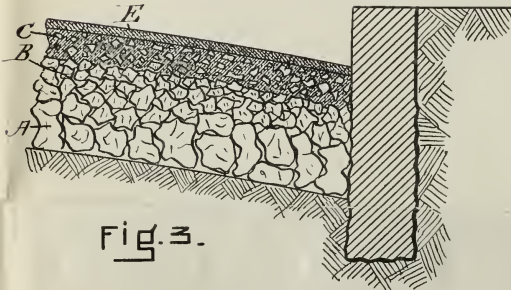


Fig. 3.

WITNESSES.

J. M. Dolan
Saul Sappenstein

INVENTOR.

Frederick J. Warren
by his attys.
Clark & Fitzgerald

UNITED STATES PATENT OFFICE.

FREDERICK J. WARREN, OF NEWTON, MASSACHUSETTS.

PAVEMENT OR ROADWAY.

SPECIFICATION forming part of Letters Patent No. 675,430, dated June 4, 1901.

Application filed January 9, 1901. Serial No. 42,626. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK J. WARREN, a citizen of the United States, residing at Newton, in the county of Middlesex and State of Massachusetts, have invented a new and useful Improvement in Pavements or Roadways, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification, in explaining its nature.

The invention relates to a pavement or roadway having a foundation layer of stone such as is used in ordinary Macadam or Telford roads or a combination of the two, and upon which is arranged one or more layers of smaller stone coated or partly coated with coal-tar, coal-tar pitch, asphalt, or a mixture of them or other equivalent bituminous material, and which is thoroughly rolled preparatory to receiving a finishing or binding layer consisting of crushed or broken stone or gravel mixed with fine crushed screenings, sand, gravel, or other equivalent earthy matter in such proportion that the fine particles of stone, sand, or gravel in said surface or binder layer will readily enter and fill the large voids and spaces in and between the larger stone and gravel, the said last-named ingredients being first thoroughly mixed with or without heating and preferably by suitable machinery with coal-tar, coal-tar pitch, asphalt, or a mixture of them or equivalent bituminous material, thoroughly incorporated with them and in such proportions as to form a solid impervious bituminous wearing surface or binder united by pressure and by permeation with the intermediate course or layer of stone upon which it is erected, and with the voids and spaces therein the under surface of the said surfacing or binder layer knits. This surfacing or binding layer is preferably of uniform thickness throughout and consolidated by means of pressure or a heavy steam-roller.

The invention will now be described in connection with the drawings, wherein—

Figure 1 is a view in vertical section of a pavement having the features of my invention. Fig. 2 is a detail view in section, enlarged, of Fig. 1. Fig. 3 is a detail view in section, enlarged, of a modification.

The foundation layer of stone A may be of

the Macadam order or the Telford arrangement or a combination of the two, and it is laid in any usual way. Upon it is arranged the layer B of smaller stone, which preferably are coated or partly coated with coal-tar, coal-tar pitch, asphalt, or a mixture of them or other equivalent bituminous material. The stones composing this layer will vary in size from two inches in diameter to six inches in diameter, and the layer is thoroughly rolled into the foundation layer and will when completed furnish a surface which is coarse and a constituency which is more or less cellular in character. Upon and into this prepared surface is then thoroughly rolled a heavy layer of specially-prepared ingredients which have reference to their packing and binding character with regard to each other and also with respect to the character of the surface which is to receive it and of the voids, cells, or spaces in it. This layer is a binding or surfacing layer, and it is constituted to unite with the rough surface of its supporting-layer by entering the spaces, channels, and voids between the stones thereof to a very considerable extent and so as to fill them. It is further constituted to make a continuous, homogeneous, solid layer of its own composition above the line of union with the layer below and to provide a hard, firm, solid, waterproof, tenacious, non-friable covering for the foundation, and the surface of which may serve as the finished surface of the pavement or may act to receive a finishing-surface of a somewhat different character. It is obvious from what I have said that this layer must be very carefully prepared, as upon it hinges the effectiveness of the invention. It is composed of a mixture of relatively coarse particles one-half inch to three inches in diameter, intermediate particles one-tenth inch to one-half inch in diameter, and fine particles (an impalpable powder) to one-tenth inch in diameter, suitably proportioned, graded, and thoroughly mixed, either hot or cold, with an incorporated composition of coal-tar, coal-tar pitch, asphalt, or other equivalent bituminous material or a combination of them. The ingredients are such as will pass through screens having a three-inch mesh, a half-inch mesh, one-tenth of an inch mesh, one-fortieth of an inch mesh, one-eightieth of an

inch mesh, and one two-hundredth of an inch mesh. Of the ingredients passing through a screen of three-inch mesh and remaining upon a screen of one-half-inch mesh I take about seventy parts. Of the ingredients passing through a screen of a one-half-inch mesh and remaining upon a screen of one-tenth-inch mesh I take twenty parts and the same as to screens of one-tenth-inch mesh and one-fortieth-inch mesh. I take four parts of screens of one-fortieth-inch mesh and one-eighth-inch mesh, three parts of screens of one-eighth-inch mesh and one two-hundredth-inch mesh, and of material passing through a screen of one-two-hundredth-inch mesh one part. To one hundred parts, by weight, of these ingredients, in the proportions above stated, there are added about six parts of the coal-tar, coal-tar pitch, asphalt, or a mixture of them or other equivalent bituminous material, which, preferably, has been heated in a separate vessel, and the ingredients and the bituminous material are intimately intermingled. The percentage of the bituminous material to the aggregate of ingredients may be varied and to obtain the best results must be varied as the shape and size of the larger particles in the aggregate vary and also with the degree of purity of the bituminous material used.

The surface of the roadway may or may not be covered with a thin coating of bituminous mixture of sand, gravel, screenings, or gravel mixed with coal-tar or other equivalent material.

Referring again to the drawings, C represents the layer of prepared ingredients, and E, Fig. 3, the thin finishing coating above referred to.

I am aware that tarred Macadam pavements or roadways have been used in which the several courses of stone are coated with tar, in an effort to hold the top course of tarred stone about two inches in size in position by spreading over and rolling into the surface a fine mixture of sand and tar; but this only partially fills the voids in the top course of stone, leaving voids in the lower portion of this course of stone, so that under traffic the stones become displaced and lose the essential solidity desired. I am also aware that asphalt-pavement mixtures have been made with particles of sand and pulverized stone carefully graded in size from about one-tenth of an inch in diameter down to an impalpable powder, so as to secure the least possible voids and greatest possible density within those limits.

By my improvement I obviate the difficulty of lack of solidity of the top course of the tarred Macadam pavements as now laid by thoroughly mixing and incorporating with the larger particles of the aggregate finer particles of crushed stone or sand or other equivalent, so graded as to give a minimum of voids, which

are then filled with coal-tar, coal-tar pitch, asphalt, or other equivalent bituminous material, forming a solid bituminous concrete wearing-surface and which I prefer to lay from one to three inches or more in thickness. By using in the concrete coarse particles of stone or gravel from about one-half inch to about three inches in diameter and medium particles of the same from one-tenth inch to one-half inch in diameter my invention provides a composition having fewer voids, and therefore requiring less of the bituminous material to make a solid concrete, than is now used in surface mixture for asphalt or other bituminous pavements.

The concrete mixture which I have described may also be used as an intermediate or binder course between hydraulic-cement, concrete, bituminous-concrete, or broken-stone foundation and the wearing-surface of an ordinary asphalt pavement and is an improvement on binder courses previously used, for the reason that it forms a more solid and impervious binder course.

Having thus fully described my invention, I claim and desire to secure by Letters Patent of the United States—

1. In a tar, asphalt or bituminous, Macadam roadway or pavement, a wearing surface or binder course composed of coarse particles one-half inch to three inches in diameter, intermediate particles one-tenth inch to one-half inch in diameter and fine particles (an impalpable powder) to one-tenth inch in diameter in about the proportions named and intimately combined either hot or cold with coal-tar, coal-tar pitch, asphalt or other equivalent bituminous material and rolled upon a prepared foundation to form a union therewith and a solid, water-tight, bituminous consistency, substantially as set forth.

2. The combination in a pavement or roadway of a foundation layer of large stone, a suitable layer of small stone coated with bituminous material and rolled to a union with the larger stone and a rough surface and a layer of composition comprising coarse particles one-half inch to three inches in diameter, intermediate particles one-tenth inch to one-half inch in diameter and fine particles (an impalpable powder) to one-tenth inch in diameter in about the proportions indicated, mixed hot or cold with coal-tar, coal-tar pitch, asphalt or other equivalent bituminous material spread upon and rolled into the prepared foundation making union with the surface thereof and filling the voids and spaces therein whereby it is knitted thereto and whereby also a solid, water-tight bituminous surfacing is provided.

FREDERICK J. WARREN.

Witnesses:

F. F. RAYMOND, 2d,
J. M. DOLAN.

Sections 374, 375, 376, 377, 378 and 379 of the Charter of the City of Portland.

COUNCIL MAY ORDER IMPROVEMENT.

SECTION 374. The Council, whenever it may deem it expedient, is hereby authorized and empowered to order the whole or any part of the streets of the city to be improved, to determine the character, kind and extent of such improvement, to levy and collect an assessment upon all lots and parcels of land specially benefited by such improvements, to defray the whole or any portion of the cost and expense thereof, and to determine what lands are specially benefited by such improvement and the amount to which each parcel or tract of land is benefited.

CITY ENGINEER TO MAKE PLANS AND SPECIFICATIONS;
DISTRICTS; ASSESSMENT.

*SECTION 375. Whenever the Council shall deem it expedient or necessary to improve any street or streets or any part or parts thereof within a district in the City of Portland, it shall require from the City Engineer plans and specifications for an appropriate improvement and estimates of the work to be done and the probable cost thereof, and the City Engineer shall file such plans, specifications and estimates in the office of the Auditor of the City of Portland. If the Council shall find such plans, specifications and estimates to be satisfactory, it shall approve the same and shall determine the boundaries of the district benefited and to be assessed for such improvement, and the action of the

Council in the creation of such assessment district shall be final and conclusive. The Council shall by resolution declare its purpose of making said improvement, describing the same and including such Engineer's estimate of the probable total cost thereof, and also defining the boundaries of the assessment district to be benefited and assessed therefor. The action of the Council in declaring its intention to improve any street or streets or any part or parts thereof, directing the publication of notice thereof, approving and adopting the plans, specifications and estimates of the City Engineer, and determining the district benefited and to be assessed thereby, may all be done in one and the same act.

*As amended June 3, 1907.

PUBLICATION OF RESOLUTION ; NOTICES.

SECTION 376. The resolution of the Council declaring its purpose to improve the street shall be kept of record in the office of the Auditor and shall be published for ten consecutive publications in the city official newspaper. The City Engineer within five days from the first publication of said resolution shall cause to be conspicuously posted at each end of the line of the contemplated improvement a notice headed "Notice of Street Work" in letters of not less than one inch in length, and said notice shall contain in legible characters a copy of the resolution of the Council and the date of its adoption, and the Engineer shall file with the Auditor an affidavit of the posting of said notices,

stating therein the date when, and places where the same have been posted.

REMONSTRANCES.

*SECTION 377. Within twenty days from the date of the first publication of the notice required to be published in the preceding Section, the owners of four-fifths or more in area of the property within such assessment district may make and file with the Auditor a written objection to or remonstrance against said proposed improvement, and said objection or remonstrance shall be a bar to any further proceedings in the making of such improvement for a period of six months unless the owners of one-half or more of the property affected as aforesaid shall subsequently petition therefor; provided, that if any such objection, remonstrance or petition shall be signed by the agent or attorney of any property owner, there shall be filed with the Auditor within the time provided for such remonstrance or petition the written authority for such agent or attorney to sign any such remonstrance or petition, otherwise the signature shall be disregarded.

*As amended June 3, 1907.

JURISDICTION OF COUNCIL—WHEN ACQUIRED.

*SECTION 378. If no such objection or remonstrance be made and filed with the Auditor within the time designated, or if any remonstrance filed is not legally signed by the owners of two-thirds of the property affected the Council shall be deemed to have acquired jurisdiction to order the improvement to be

made, and the Council may thereafter and within three months from the date of the final publication of its previous resolution by ordinance provide for making said improvement, which shall conform in all particulars to the plans and specifications previously adopted.

When the Council shall, by ordinance, provide for making an improvement, the city shall be deemed to have appropriated and acquired ownership of all earth above grade and within the street lines for said improvement and no private ownership shall thereafter be claimed in said earth.

*As amended June 7, 1909.

EXECUTIVE BOARD TO MAKE CONTRACT.

SECTION 379. Upon the approval of said ordinance by the Mayor, or if the same shall become valid without his approval, the Auditor shall present to the Executive Board, at its next regular meeting, a copy of said ordinances, and the estimates, plans and specifications previously prepared by the City Engineer and adopted by the Council. Thereafter the said Executive Board, without delay, shall give notice by publication for not less than five successive days in the city official newspaper, inviting proposals for making said improvement. The Executive Board shall have the power to award the contract or contracts for said improvement and to impose such conditions upon bidders with regard to bonds and securities, and guarantees of the good faith and responsibility of bidders, for insuring the faithful completion of the work in strict accordance with the specifications therefor, and to make all rules and regu-

lations in the letting of contracts that may be considered by said board as advantageous to the city. Such contract or contracts shall be let to the lowest responsible bidder for either the whole of said improvement or such part thereof as will not materially conflict with the completion of the remainder thereof, but said board shall have the right to reject any or all proposals received. It shall be the duty of the Executive Board to fix the time in which every such improvement shall be completed and it may extend such time should the circumstances warrant. The said board shall have power and authority to make all written contracts, to receive and approve all bonds authorized by this section, to provide for the proper inspection and supervision of all work done under the provisions of this Article, and to do any other act to secure the faithful carrying out of all contracts, and the making of improvements in strict compliance with the ordinance and specifications thereof.

